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SRI: Green Power Development and Energy Efficiency Improvement Investment Program – Tranche 2 (Medium-voltage network efficiency improvement)

Prepared by Ceylon Electricity Board, Ministry of Power and Renewable Energy, Democratic Socialist Republic of Sri Lanka for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 22 July 2016)

Currency unit	-	Sri Lanka rupee/s (SLRe/SLRs)
SLRe1.00	=	\$0.00684
\$1.00	=	SLRs146.03

ABBREVIATIONS

ADB	_	Asian Development Bank
CCD	_	Coast Conservation Department
CEA	_	Central Environment Authority
CEB	_	Cevlon Electricity Board
DC or D/C	_	Double Circuit
DPR	_	Detailed Project Report
DSD	_	Divisional Secretariat Divisions
EA	_	Executing Agency
EARF	_	Environmental Assessment and Review Framework
FIA	_	Environmental Impact Assessment
EMoP	_	Environmental Monitoring Plan
FMP	_	Environmental Management Plan
FHV	_	Extra High Voltage
GHG	_	Green House Gas
GND	_	Gram Niladhari Divisions
GoSI	_	Government of Sri Lanka
GRC	_	Grievance Redress Committee
GRM	_	Grievance Redress Mechanism
IA	_	Implementing Agency
IEE	_	Initial Environmental Examination
	_	Line – in-Line- out
MFF	_	Multi-tranche Financing Facility
MPRE	_	Ministry of Power and Renewable Energy
PAA	_	Project Approving Authority
NARA	_	National Aquatic Resources Research & Development Agency
PCB	_	Poly Chlorinated Biphenyl
NEA	_	National Environmental Act
PIU	_	Project Implementing Unit
PMU	_	Project Management Unit
PRDA	_	Provincial Road Development Authority
PUCSI	_	Public Utility Commission of Sri Lanka
RFA	_	Rapid Environment Assessment
ROW	_	Right of Way
RP	_	Resettlement Plan
SC or S/C	_	Single Circuit
SF ₆	_	Sulphur Hexafluoride
SPS	_	Safeguard Policy Statement
		WEIGHTS AND MEASURES
ha (hectare)	_	
km (kilometer)	_	1 000 meters
kV	_	kilovolt (1 000 volts)
kW	_	kilowatt (1,000 watts)
MW	_	Mena Watt
		moga tratt

NOTE{S}

In this report, "\$" refers to US dollars. "SLRs" refers to Sri Lankan rupees

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Table of Contents

EXE		SUMMARY	1
1.0		RODUCTION	4
	1.1	Dackground	4
20	1.2		6
2.0	24	LICT, LEGAL, AND ADMINSTRATIVE FRAMEWORK	7
	2.1	Applicable Environmental and other Legislations	10
	2.2	Assessment of Legal and institutional Framework	10
	2.3	Applicable International Environmental Agreements	17
	2.4	Asian Development bank's Saleguards Policies	10
20	2.0	SCRIPTION OF THE DRO IECT	10
3.0	21	The Project	20
	3.1	Type of Project	20
	3.2	Justification for the Project	22
	3.0		22
	3.4	Size and the Magnitude of the Operation	20
	3.5	Implementation Plan	12
40	0.0 DE	SCRIPTION OF ENV/IRONMENT (BASELINE DATA)	42
4.0	4 1	Anuradhanura District	43
	4.1	Kandy District	46
	43	Trincomalee District	40
	4.0	Colombo District	54
	4.5	Ratnanura District	58
	4.6	Hambantota District	63
	47	Galle District	68
	4.8	Kalutara District	75
5.0	AN	TICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES	79
0.0	5.1	Environment Impacts and Mitigation Measures	79
6.0	AN	ALYSIS OF ALTERNATIVE	84
	6.1	CEB'S Approach for Route Selection	84
	6.2	Alternatives for Line Alignment	84
7.0	INF	ORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION	90
	7.1	Consultation Findings	91
8.0	GR	IEVANCE REDRESS MECHANISM	95
	8.1	Awareness of Stakeholders	95
	8.2	Grievance Redress Mechanism and PUCSL	95
9.0	EN	VIRONMENT MANAGEMENT PLAN	99
	9.1	Environmental Management Plan	99
	9.2	Environmental Management Plan Budget Costs	103
	9.3	Monitoring of Environmental Management Plan (EMP)	105
	9.4	Institutional Arrangements	106
	9.5	Critical Environmental Review Criteria	108
10.0	CO	NCLUSIONS AND RECOMMENDATIONS	110
Anne	exure 1	System Design Standards Followed by CEB for Setbacks etc.	111
Anne	exure 2	Route Analysis for 33 kV lines	117
Anne	exure 3A	Locational Analysis for Gantry based Switching stations	121
Anne	exure 3B	Locational Analysis for Power Switching stations (PSS)	122
Anne	exure 4:	Inventorisation along the 33 kV Distribution Lines	124
Anne	exure 5	Environment Management Plan (EMP)	132
Anne	exure 6	Environmental Parameters and Periodicity for Environmental Monitoring Plan	140

Annexure 7	Environmental Safeguard Monitoring Report	143
Annexure 8	Granting of Necessary Way leaves for Electricity Networks in Sri Lanka - Guidelines for	
Licensees, Div	isional Secretaries and Landowners and/or Occupiers	145
Annexure 9	Site Visit Photographs for Distribution lines	149

EXECUTIVE SUMMARY

1. ADB is proposing to extend USD 150 million loan to Sri Lanka's power sector for Green Power Development and Energy Efficiency Improvement Investment Program (Tranche 2) with a focus to support wind-power development and identify the transmission and distribution projects for evacuation of renewable energy (wind) parks/ projects and overall improvement of energy efficiency and capacity development.

2. The medium-voltage network efficiency improvement of the Green Power Development and Energy Efficiency Improvement Investment Program include:

- D-1 Construction of a new 23 km 33 kV from Old Anuradhapura Grid Substation (GSS) to Mahailuppallama Gantry
- D-2 Gantry at Mahailuppallama
- D-3 Construction of a new 4 km 33 kV line from Ethgala Gantry to Storefield Gantry
- D-4 Gantry at Ethgala
- D-5 Construction of a new 8 km 33 kV line from Kappalthurai GSS to Chinabay Gantry
- D-6 Gantry at Chinabay
- D-7 Augmentation of Ethulkotte Power Substation (PSS)
- D-8 Construction of a new 11 km 33 kV line from Embilipitiya GSS to Weniwelara
- D-9 Gantry at Weniwelara
- D-10 New PSS at Rattanapitiya
- D-11 Augmentation of Beligaha PSS
- D12 Construction of a new 14 km 33 kV line from Matugama GSS to Bentota PSS

3. The selected 250-300 m² plots of land required for gantry based switching stations for Mahailuppallama and Chinabay will be based on government lands and no acquisition of land will be required from the surrounding communities. CEB will get the land (0.03 Ha) transferred from the Dept. of Agriculture and Sri Lanka Ports Authority. Ethgala and Weniwelara gantry lands belong to the private owners and the CEB will purchase the land with mutual buyer seller agreement.

4. The 23 km, 33 kV distribution line from Old Anuradhapura GSS to Mahailuppallama gantry traverse paddy fields, home gardens, scrublands, chena and degraded lands. About 50% of the line (11.43 km) is over the paddy fields, 5.87 km in scrubland/ degraded forests lands, 4.43 km in home gardens, and 0.97 km in marshy areas and over the water bodies. Forest trees (103), non-fruit trees (129) and 34 fruit trees have to be removed during the construction of the line. The 04 km, 33 kV distribution line from Storefield gantry to proposed Ethgala gantry traverses through home gardens, grasslands, tea small holdings, and open/degraded lands. It crosses Mahaweli River between Angle Point 3 and AP 4. The line travels parallel to the existing 33 kV line at Hakwalapatana village and Hopewell colony. 92 non-fruit trees and 6 fruit trees have to be removed during the construction of the line. The 8 km, 33 kV distribution line from Kappalthurai GSS to China Bay gantry traverses 80% through teak plantations/drv-mixed evergreen forest and scrublands while the rest passes through home gardens and paddy fields. The line travels parallel to the railway line. Forest trees (490) and non-fruit trees (63) have to be removed during the construction of the line. The 11 km, 33 kV distribution line from Embilipitiva GSS to Weniwelara gantry traverses through paddy fields, home gardens, scrublands/ forest, riverine vegetation at Walawe River, banana plantations and open areas/ degraded lands. 234 trees have to be removed for the construction of the line. The 14 km, 33 kV distribution line from Matugama GSS to Bentota PSS traverses through paddy fields, home gardens, coconut and oil

palm plantations, marsh lands, mangrove areas near Polduwa and degraded lands. The line crosses the expressway (Colombo- Galle), Bentara River and the Galle road before reaching the Bentota PSS. 120 oil palms, 250 rubber trees and 245 coconut trees have to be removed for the construction of line. For all the above sub-projects, no wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW.

5. Impacts are manageable and can be managed cost effectively - environmental impacts are likely to result from the proposed project development. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures have been specified to ensure that minimal impacts take place. The detailed design would ensure inclusion of any such environmental impacts, that could not be specified or identified at this stage, is taken into account and mitigated where necessary. Those impacts can be reduced through mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites.

6. The proposed project will have number of positive impacts and negative impacts to the existing environment as follows:

- Significant improvement of the quality and reliability of the electricity supply to the project affected area according to current demand is the main positive impact.
- Removal of trees for the distribution line is the main negative impact to the proposed project area.
- Environment pollution due to cut and fill operations, transportation of construction materials, disposal of debris, disturbance to the farming activities, nuisance from dust, noise, vehicle fumes, black smoke, vibration etc. due to construction activities are the short term negative impacts due to proposed project.
- There will be loss of agricultural productivity due to obstruction and reduce the land of paddy fields as well as cutting of home gardens, coconut and rubber plantations; which will be compensated based on established rates by CEB.

7. Benefits far outweigh negative impacts - The proposed project will improve operational efficiency and quality of power, voltages, reliability of the system and at the same time will reduce system losses. Supply of power to both the local areas and regions will boost economic development of the area by strengthening the power distribution infrastructure. Overall, the major social and environmental impacts associated with distribution projects are limited to the construction period and can be mitigated to an acceptable level by implementation of recommended measures and by best engineering and environmental practices.

8. Various mitigation measures to be taken prior to the project activities are listed in the IEE. Potential adverse environment impacts associated with distribution lines have been avoided or minimised through careful route selection. Forests areas and thick vegetation areas are avoided wherever possible; however, route alignment passes through scrub-lands, cultivated paddy fields, rubber cultivations, rubber plantations, tea cultivations etc. The lines will also pass through degraded forest areas but avoid any national park or sanctuary. The alignments in this project have also avoided wetlands and geologically unstable areas, which can also pose foundation related problems. Government land will be used for all proposed gantry based switching stations but no land will be acquired for placing distribution towers on private land. However, physical damage to the crops during the construction phase of the project will be compensated at the time of damage as per GoSL norms. Associated impacts on agricultural land will not be lost permanently at the base of the distribution tower. After

construction, agricultural land within the distribution corridors can be used again for farming purpose.

9. Since the project does not involve activities that have significant adverse impacts, an initial assessment has been done to determine the extent of impacts as per the ADB's Safeguard Policy Statement 2009. Although the overall Tranche 2 environment category is "A" due to other project component, the environmental classification for this component is "Category B". The IEE report is consistent with ADB's Safeguard Policy Statement 2009.

1.0 INTRODUCTION

1.1 Background

1. Sri Lanka has experienced high economic growth in the recent years. With the end of civil conflict in 2009, the country requires sustained focus on post-conflict infrastructure development to remove disparities in economic and social status of the poorer Eastern and Northern provinces. Asian Development Bank (ADB)'s focus on development of power sector infrastructure in partnership with other development partners, contributes to the provision of reliable, adequate, and affordable power supply for sustainable economic growth and poverty reduction in Sri Lanka.

2. The power sector has undergone significant policy level and structural changes in the recent years:

- Sri Lanka Electricity Act passed in Parliament in 2009;
- Assumption of the role of electricity regulator in April, 2009 by the Public Utilities Commission of Sri Lanka (PUCSL);
- Creation of Functional Business Units (FBU's) within the CEB with one unit each for generation and transmission and 4 geographical units for distribution function; and
- All FBU's have been issued licenses by the Public Utilities Commission of Sri Lanka (PUCSL) and they have been filing the tariff petitions since 2010.

3. Sri Lanka's electricity industry is managed by the Ministry of Power & Energy (MPRE). All electricity utilities remain under direct or indirect state ownership, whereas, there is significant private sector participation in power generation. The institutions listed in **Table 1** are active in the electricity industry whereas **Table 2** lists the regulatory and facilitation agencies in Sri Lanka.

Institution	Functions and other information		
Government			
Ministry of Power and	Energy policy, project implementation and monitoring,		
Renewable Energy (MPRE)	supervision of state-owned electricity utilities.		
Ministry of Petroleum and	Petroleum industry project implementation and monitoring,		
Petroleum Resource	supervision of state-owned petroleum corporation, petroleum		
Development (MOPPRD)	resource development and exploration.		
Electricity utilities			
Ceylon Electricity Board	State-owned corporation, engaged in power generation (one		
(CEB)	license, 23 power plants), transmission (one license), and		
distribution (four licenses, about 4.5 million customers).			
Lanka Electricity Company	State-owned company, engaged in power distribution (one		
(P∨t) Ltd	license, 450,000 customers) along western and southern coastal		
(LECO)	regions.		
Independent Power Producers	(IPPs)		
Ten thermal IPPs to grid, two	Each IPP an individual company, eight diesel power plants and		
thermal IPPs in Jaffna mini-	two combined cycles on the main grid, two diesel power plants on		
grid	the Jaffna mini-grid.		
About 100 small renewable	Each SPP an individual company, small hydro (about 95), rice-		
energy IPPs (also known as	husk (2), and waste-heat (1).		
Small Power Producers,			

Table 1. Insulutions in the energy supply industry
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SPPs)

About 300 community small hydro-based distribution			nall	About 5000 households are served in total.
cooperatives				
About 120,0	000	solar	home	Serving an equal number of households.
systems				

Table 2- Regulatory and Facilitation Agencies				
Institution	Functions and other information			
Sri Lanka Sustainable Energy	Policy, promotion and regulatory functions of (i) renewable energy			
Authority (SEA)	(ii) energy efficiency, and (iii) energy planning, (iv) energy fund			
	management.			
Public Utilities Commission of	Infrastructure regulatory commission presently empowered to			
Sri Lanka (PUCSL)	regulate (i) electricity industry (ii) bunker and lubricating oil			
	industries. In future, Petroleum Industry regulation is likely to be			
	assigned to PUCSL.			

4. Ceylon Electricity Board (CEB) is a corporate body established for development and coordination of the generation, transmission, and distribution of electrical energy in Sri Lanka. It holds six separate licenses for these activities. The license for generation division caters for 66% of the power to the grid. The transmission network consists of 55 GSSs (132/33 kV, 220/132/33 kV, 220/132 kV and 132 /11 kV) and 2,236 km of HV Lines (both 220 kV and 132 kV) approximately.

5. The island is divided into four regions for power distribution, supply and sales, where each distribution division holds a license. These distribution licenses cover more than 97% of the geography of Sri Lanka. Lanka Electricity Company Ltd. (LECO), which is a subsidiary of CEB, covers the remaining areas catering to 478,500 customers. Electricity Distribution Network of CEB consists of MV lines (33 kV and 11 kV), primary substations (33 kV/11 kV), distribution substations (33 kV/400 V and 11 kV/400 V), and LV lines (400 V).

6. ADB is proposing to extend USD 150 million loan (with additional USD 30 million in cofinancing) to Sri Lanka's power sector for green power development and energy efficiency improvement in Tranche 2. The specific focus of this assistance is to identify the transmission and distribution projects which could be funded through the proposed loan. The projects identified for the ADB financing are focused on evacuation projects for renewable energy (wind) parks/projects and overall improvement of energy efficiency.

7. The proposed Tranche 2 project will assist GoSL to develop a least-cost project implementation of the following project components:

i. Transmission infrastructure enhanced. This includes (a) construction of 144 km of 220 kV and 23.7 km of 132 kV transmission lines, 132 kV in and out connection cable line, and second circuit stringing of 100 km 132 kV Habarana- Valachchenai transmission line; (b) augmentation of existing 220/132/33 kV Biyagama and Kotugoda, 220/33 kV Mannar, Colombo C, Kolonnawa Stanley, 132/33 kV Kolonnawa, Padukka, Horana, Dehiwala and Madampe grid substations; (c) construction of 220/132/33 kV Hambantota, 220/33 kV Naddukuda and Biyagama, and 132/11 kV Colombo B grid substations in the Northern, North Central, Western, and Southern provinces to absorb the increased power demand and ensure stable system operation with intermittent wind and solar generation.

- ii. Efficiency of medium-voltage network improved. This includes (a) construction of 60 km of 33 kV lines in Mahailuppallama, Ethgala, China Bay, Sooriyawewa and Bentota areas, and gantries in Mahailuppallama, Ethgala, China Bay, and Weniwelara areas; and (b) augmentation of 33/11 kV Ethulkotte and Beligaha and primary substation, and construction of 33/11 kV Rattanapitiya primary substation in the Central, Eastern, North Central, Southern and Western provinces to address overloading of conductors and voltage drop in medium- voltage lines.
- iii. Demand-side management for energy efficiency improved. An innovative smart grid and metering pilot subproject, including installation of 10,000 smart meters with the smart metering infrastructure and meter management system, will be developed in the Kantunayake Depot Area in the Western Province.

1.2 Scope of Work and Methodology Adopted

- 8. The broad scope of the Environmental Assessment study is:
- i. To conduct field visits to collect data relevant to the study area and also collect secondary data so as to establish the baseline environmental status of the study area;
- ii. To assess the impacts on environmental attributes due to the location, design, construction and operation of the proposed project;
- iii. To prepare a mitigation plan outlining the measures for protecting the environment including institutional arrangement and environmental monitoring;
- iv. To identify critical environmental attributes required to be monitored subsequent to the implementation of the proposed project;
- v. To carry out consultation with local people so as to identify the public perception of the project; and
- vi. To establish the Environment Monitoring Plan (EMoP) for the CEB to submit environmental monitoring reports to ADB on a semi-annual basis.

9. This report is prepared on the basis of survey, field study and with the help of available secondary data. The alignment of line may slightly vary after the exact demarcation of tower location. Accordingly, the field surveys were undertaken to assess physical and biological environment. Detailed assessment of the baseline environment has been conducted for the distance up to 500 m on the either side of proposed alignment and data collection from secondary source has been done to support the findings of the field survey. The field studies were supported by data collected from secondary sources such as internet, forest atlas.

10. The IEE report comprises baseline data on existing physical, ecological, economic, and social condition, together with the anticipated environmental impacts and proposed mitigation measures. Observations were made through transect walk along the distribution line tower locations, as well as in and around the proposed premises for new PSS, distribution lines and old PSS where augmentation will occur between March-April 2016. Public consultations were held with the project affected communities, stakeholders, and government officers that relate to existing environmental conditions around the distribution lines and substations and the potential impacts that could happen due to project implementation. In addition, secondary data was collected from published data from GoSL documents, 2001 population census statistics data, as well as from authorities such as CEB, MPRE and other departments.

11. Based on the Central Environmental Authority (CEA) Guidelines of GoSL, the proposed distribution projects are not categorised. However, an initial assessment has been done in this report to determine the extent of impacts as per the ADB's Safeguard Policy Statement 2009. Although the overall environment category for Tranche 2 projects is Category 'A", the

environmental classification for the Component B is "Category B" and does not require an EIA.

POLICY, LEGAL, AND ADMINSTRATIVE FRAMEWORK 2.0

2.1 Applicable Environmental and other Legislations

A large number of recurrent and non-recurrent activities under establishment of 12. distribution lines and substations are not covered by the National Environmental Act (NEA) as shown in Table 3.

l able 3:	Applicable Enviror	imental Policy and Proce	aures
Name	Scope and Objectives	Key Areas	Operational Agencies / Key Players
Agrarian Services Act (Nº 58 of 1979) Agrarian Development Act Nº 46 of 2000	To provide secure background to farmers and their agricultural premises	Regulates the acquisition of land that belongs to paddy and other activities, which are related to agricultural areas.	The Ministry of Agriculture Development and Agrarian Services
Ceylon Electricity Board Act , 1969	To provide for the establishment of an electricity board for the development and co - ordination of generation	Enters with joint schemes by such board with any government department or approved body for the generation of electrical energy, the irrigation lands, control of floods or other like objects, and to make provision for all matters connected there with or incidental thereto.	Ceylon Electricity Board
Electricity Act 2009	To provide reliable and cheap electrical energy	Regulates the generation, transmission, transformation, distribution, supply and use of electrical energy	Ceylon Electricity Board
Fauna and Flora Protection (Amendment) Act 1993 (Nº 49 of 1993).	To provide greatest protection to fauna and flora	Makes provision for the establishment of protected areas, regulates human involvements to such areas and their fauna and flora.	Department of Wild Life and Department of Forest
Felling of Trees (Amendment Act N ^o 01 of 2000 and Act to Amend felling of trees control)	The controlled removal of trees.	Regulates the removal of trees relevant to type and the compensation	Department of Forest
Fisheries and Aquatic Resources Act 1996	To provide for the management, regulation , conservation and	Restricts detrimental or risk activities for aquatic fauna and flora	National Aquatic Resources Research & Development Agency

Applicable Environmental Baliev and Breadures Table 2

Name	Scope and Objectives	Key Areas	Operational Agencies / Key Players
	development of fisheries and aquatic resources		(NARA) and CEA
Flood Act Nº 22 of	Protection of areas	Flood prevention	Department of
Forest Ordinance Act Nº 13 of 1966 Forest (Amendment) Act Nº 65 of 2009	Conservation, protection and management of forest and forest resources for control of felling and transport of timber	Definition of Conservation Forest, Reserve Forest, Village forests	Forest Department
Irrigation Clauses Act 1973	To provide regulations for the construction of structures across the irrigation canals and water resources.	Regulates the construction of structures across the irrigation canals and water resources.	Department of Irrigation
Land Acquisition (Amendment) Act, № 13 of 1986	Establishes the procedure to be followed by the competent authorities for the acquisition of land for public purpose.	It includes, among other matters: investigations for selecting land to be carried out by a district officer appointed by the Minister; issue of notice of intended acquisition indicating the compensation to be paid for any damage caused during investigations; issue of notice of acquisition of land or servitude for a public purpose.	Department of Valuation
Monuments and Archaeological Sites and remains Act, 1958. Act Nº24 of 1958 Antiques Ordinance, 1960	An Act to provide for the preservation of ancient and historical monuments and archaeological sites and remains of national importance	For the regulation of archaeological excavations and for the protection of sculptures, carvings and other like objects etc.	Department of Archaeology
Motor Traffic Act Nº 60 of 1979	To provide sustainable approach for vehicle traffic	Regulates vehicle traffic during transportation of construction materials and the construction activities	
National Environmental Act N° 47 of 1980, amendment N° 56 of 1988, and other	Provide protection, management, enhancement of the environment with prevention and control	Regulates sustainable utilisation of almost all natural resources such as water, soil and air	Central Environmental Authority (CEA)

Name	Scope and Objectives	Key Areas	Operational Agencies / Key Players
amendments	of pollution		
National Environmental (Protection & Quality) Regulations, No 01 1990.	To provide for the prevention and control of water pollution and enhancing the quality of water	Controls sewage and effluents into inland surface water	CEA
National Environmental (Ambient Air Quality) Regulations, 1994.	To provide for the prevention and control of air pollution	Controls emissions of air pollutants	CEA
National Environmental (Noise Control) Regulations Nº1 1996	To provide maximum allowable noise levels	Regulates noise pollution	CEA
National Involuntary Resettlement Policy	Land Acquisition Act does not deal with the broader social and economic impacts of the project. Thus, this policy was established to overcome these impacts.	To monitor land replacement, income restoration, relocation assistance and allowances, consultation and grievance redress, assistance to vulnerable groups and provision of resettlement sites and services.	Government of Sri Lanka / Land Acquisition and Resettlement Committee (LARC)
Public Utilities Commission of Sri Lanka Act , Nº 35 of 2002	Create an environment for all inhabitants of Sri Lanka and the contributors to its development, to have access to essential infrastructure and utility services in the most economical manner within the boundaries of the sustainable development agenda	Regulate all the utilities within the purview of the Public Utilities Commission of Sri Lanka, to ensure safe, reliable and reasonably priced infrastructure services for existing as well as future consumers in the most equitable and sustainable manner.	The Public Utilities Commission of Sri Lanka
Soil Conservation (Amendment) Act Nº 24 of 1996	Act for conservation of soil resources and productive capacity of land	Degraded Land, prevent damage against salinity, water logging, drought, floods	Soil Conservation Board
Sri Lanka Sustainable Energy Authority Act, № 35 of 2007	To develop renewable energy resources; to declare energy development areas; to implement energy efficiency measures and conservation programmes; to	Reliability and cost effectiveness in energy delivery and information management, function as a National Technical Service Agency of Clean Development Mechanism (CDM) in Sri Lanka that	Sri Lanka Sustainable Energy Authority

Name	Scope and Objectives	Key Areas	Operational Agencies / Key Players
	promote energy security	provides technical assistance to the Designated National Agency for Clean Development Mechanism and project developers, on energy sector clean development project activities	
National Institute of Occupational Safety And Health Act, No. 38 Of 2009	An act to provide for the establishment of the national institute of occupational safety and health for the formulation of a policy on occupational safety and health standards; to create an environment for occupational safety and health at all workplaces to protect both the employers and employees; and for matters connected therewith or incidental thereto	Occupational safety and health standards	National Institute of Occupational Safety and Health

2.2 Assessment of Legal and Institutional Framework

Sri Lankan Environmental Legislation

13. The requirement for Environmental Assessment in Sri Lanka is established by the National Environment Act No. 47 (1980), and the amendment to the act 1988, Act No. 56 Section 23A, for EPL procedure and the EIA regulation under Part 4C, under the provision of section 23Z. The procedures are defined in the environmental impact assessment (EIA) Regulations Gazette No. 772/22 (1993). The Prescribed Projects set out in the Gazette Extra Ordinary No. 772/22 of 24th June 1993, No: 1104/22 dated 6th November 1999, and No: 1108/1 dated 29th November 1999 for which environmental assessment is mandatory, and described as below:

Part I: Projects and undertakings if located wholly or partly outside the coastal zone as defined by Coast Conservation Act No. 57 of 1981.

- Reclamation of Land, wetland area exceeding 4 hectares.
- Extraction of timber covering land area exceeding 5 hectares.
- Conversion of forests covering an area exceeding 1 hectare into non-forest uses.
- Clearing of land areas exceeding 50 hectares.
- Installation of overhead transmission lines of length exceeding 10 kilometers and voltage above 50 Kilovolts.

- All renewable energy based electricity-generating stations exceeding 50 Megawatts.
- Involuntary resettlement exceeding 100 families other than resettlement affected under emergency situations.
- Development of all Industrial Estates and Parks exceeding an area of 10 hectares.

PART III: All projects and undertaking listed in Part I above irrespective of their magnitudes and irrespective of whether they are located in the coastal zone or not, if located wholly or partly within the areas specified in part III of the Schedule.

- 1. Within 100 m from the boundaries of or within any area declared under
 - i. the National Heritage Wilderness Act No. 3 of 1988.
 - ii. the Forest Ordinance (Chapter 451).
- iii. whether or not such areas are wholly or partly within the Coastal Zone as defined in the Coast Conservation Act, No. 57 of 1981.

2. Within the following areas whether or not the areas are wholly or partly within the Coastal zone:

- i. any erodable area declared under the Soil Conservation Act (Chapter 450).
- ii. any flood area declared under the Flood Protection Ordinance (Chapter 449) and any flood protection area declared under the Sri Lanka Land Reclamation and Development Corporation Act, 15 of 1968 as amended by Act, No. 52 of 1982.
- iii. 60 meters from the bank of a public stream as defined in the Crown Lands Ordinance (Chapter 454) and having a width of more than 25 meters at any point of its course.
- iv. any reservation beyond the full supply level of a reservoir.
- v. any archaeological reserve, ancient or protected monument as defined or declared under the Antiquities Ordinance (Chapter 188).
- vi. any area declared under the Botanic Gardens Ordinance (Chapter 446).
- vii. within 100 meters from the boundaries of, or within, any area declared as a Sanctuary under the Fauna and Flora Protection Ordinance (Chapter 469).
- viii. within 100 meters form the high flood level contour of, or within, a public lake as defined in the Crown Lands Ordinance (Chapter 454) including those declared under section 71 of the said Ordinance.
- ix. Areas declared under the Urban Development Authority Act No 41 of 1978 and Act No. 4 of 1982 section 29 (this indicates in its definition that laws are valid to the areas of the Local authorities).

14. The requirements for EIA and the level of study required are determined by the Central Environment Authority (CEA) after submission by the proponent of a Project Information Document (PID), plus supporting information, if relevant. There are two possible outcomes:

15. **Categorical Exclusion:** The activity is not on the list of prescribed projects in the EIA regulations, is not in or near a sensitive area, has not been the subject of public protest, and it is clear from the PID and supporting information that the project will have no significant environmental impacts. Environmental clearance is granted (with or without conditions) and the project may proceed.

16. **Environmental Assessment:** All other projects require Environmental Assessment and the CEA establishes a Scoping Committee to decide on the level of study (IEE or EIA) and prepare Terms of Reference (ToR). Alternatively, if the project lies wholly within the jurisdiction of a single government agency, only if it is a gazetted PAA agency. CEA may refer the project to this authority (as the Project Approving Agency) to administer the EIA process. A Technical Review Committee (TRC) reviews the completed IEE or EIA report and recommends whether

environmental approval shall be granted; the final decision is made by CEA.

17. There are further compliance requirements prescribed by other certain legislation, in particular the Coast Conservation Act, which requires clearance by the Coast Conservation Department (CCD) for any development activity or structure in the coastal zone¹. An Environmental Protection License (EPL) from CEA, is required for the operation of the completed facilities (A list has been published by CEA).

18. No development or encroachment of any kind is permitted in archaeological reserves declared under the Antiquities Ordinance No. 9 of 1940 as amended (Section 34). The Director General of Archaeology is empowered to conduct an Archaeological Impact Assessment of areas that may be affected by development or other projects proposed by the government or any person.

19. No construction activities are permitted in national reserves (under the jurisdiction of the Department of Wildlife Conservation - the Fauna and Flora Protection Ordinance No. 2 of 1937, as amended) and forest reserves (under the jurisdiction of the Forest Department – see the Forest Ordinance of 1907 as amended). Sanctuaries, also declared under the Fauna and Flora Protection Ordinance, may include privately held land. Clearance from the Department of Wildlife Conservation is required if construction is proposed in sanctuaries. Construction within 1 mile (1.6 km) radius of a national reserve, sanctuary or buffer zone needs permission from the Department of Wildlife Conservation (see the Fauna and Flora Protection Ordinance No. 2 of 1937, as amended). Any development activity within a fishery reserve² requires the permission and approval of the Director of Fisheries and Aquatic Resources (see the Fisheries and Aquatic Resources Act No. 2 of 1996). Any construction taking place in close proximity to a forest reserve must be approved and cleared by the Forest Department.

20. Using paddy land for a purpose other than agricultural cultivation without the written permission of the Commissioner General is a punishable offence under the Agrarian Development Act No. 46 of 2000 (Section 32). In addition to environmental clearance, approval from the local authorities and CEA for site clearance; and consent from all relevant *Pradeshiya Sabhas*, Provincial Councils, and Divisional Secretaries shall be obtained before construction begins.

21. Clearance shall be obtained for the proposed development activities, if the area is declared under the UDA Act or Sri Lanka Land Reclamation and Development Corporation (SLLR and DC) Act.

22. A summary of Government environmental compliance requirements applicable to the project is presented in **Table 4**. **Annexure 1** indicates the applicable System Design Standards used by CEB for setbacks to ensure minimum distances, safety parameter for different voltages etc.

¹ The coastal zone is defined in the Coast Conservation Act No. 57 of 1981 "as the area lying within a limit of 300 meters landward from mean high water line (MHWL). In the case of rivers, streams, lagoons or any other body of water connected to the sea, either permanently or periodically, the landward boundary extends to a limit of 2 km measured perpendicular to the straight base line drawn between the natural entrance points thereof and includes waters of such rivers, streams and lagoons or any other body of water so connected to the sea."

² Certain areas adjoining earmarked reservoirs and water bodies can be declared as a fishery reserve with the concurrence of the Ministry of Wildlife and Natural Resources.

		Components for EARF Consideration				
	Subproject	Subcomponent	Applicable Legislation	Statutory Requirement	Authorizing Body	
1	Now		National Environment	Environmontal	Control	
١.	Tronomiccion			Clearanae	Environmont	
	linee	III Selisilive aleas	ACI (NEA)			
	lines, Distribution		Coost Concernation Act			
	Distribution		Coast Conservation Act	Clearance	Coastal	
	nnes, aubatationa	alling within the				
	Substations				Department (CCD)	
		All subcomponents	Municipal Councils	Clearance	Municipal Councils,	
		inal require sile	Undinance No. 29 01		Urban Councils and	
		ciearance	Councile Ordinance No		riauesiliya Sabilas	
			61 of 1020 and the			
			Prodoshivo Sobbo Act			
			No. 15 of 1987 as			
			amended			
		All subcomponents	Felling of Trees (Control)	Tree-cutting	Forest Department	
		that require cutting of	Act No 9 of 1951	Permit		
		trees				
		All subcomponents	Fauna and Flora	Clearance	Department of	
		within a 1 mile (1.6	Protection Ordinance No.		Wildlife	
		km) radius of a	2 of 1937 as amended		Conservation	
		national reserve,				
		sanctuary, or buffer				
		zone				
		All subcomponents	Forests Ordinance No.	Clearance	Forest Department	
		in close proximity of	16 of 1907 as amended			
		a reserve forest				
		All subcomponents	Fisheries and Aquatic	Clearance	Director of Fisheries	
		in and around fishery	Resources Act No. 2 of		and Aquatic	
		reserves	1996	<u></u>	Resources	
		All subcomponent in	Antiquities Ordinance	Clearance	Department of	
		proximity of	No. 9 of 1940 as		Archaeology	
		archaeological	amended			
		reserves	Invigation Development	Clearance	Director Irrigation	
		All subcomponent in		Clearance	Director, imgation	
		dovelopment	ACI		Department	
		All subcomponent in				
		and archaeological	UDA Act No. 41 1978		Regional Director	
		reserves around	and No. 4 of 1982	Clearance		
		UDA declared areas			OBIN	
2	Solar Park.	All subcomponents	NEA	EC	CEA	
	Wind Farm	in sensitive areas		-		
		All subcomponents	Coast Conservation Act	Clearance	CCD	
		falling within the				
		coastal zone				

Table 4: Summary of Environmental Compliance Requirements of the Project Components for EARF Consideration

Subproject	Subcomponent	Applicable Legislation	Statutory Requirement	Authorizing Body
	All subcomponents that require site clearance	Municipal Councils Ordinance No. 29 of 1947, the Urban Councils Ordinance No. 61 of 1939 and the <i>Pradeshiya</i> <i>Sabha</i> Act No. 15 of 1987 as amended	Clearance	Municipal Councils, Urban Councils and Pradeshiya Sabhas
	All subcomponents that require cutting of trees	Felling of Trees (Control) Act No. 9 of 1951	Tree-cutting Permit	Forest Department
	All subcomponents within a 1 mile (1.6 km) radius of a national reserve, sanctuary, or buffer zone	Fauna and Flora Protection Ordinance No. 2 of 1937 as amended	Clearance	Department of Wildlife Conservation
	All subcomponents in close proximity of a reserve forest	Forests Ordinance No. 16 of 1907 as amended	Clearance	Forest Department
	All subcomponents in and around fishery reserves	Fisheries and Aquatic Resources Act No. 2 of 1996	Clearance	Director of Fisheries and Aquatic Resources
	All subcomponent in proximity of archaeological reserves	Antiquities Ordinance No. 9 of 1940 as amended	Clearance	Department of Archaeology
	All subcomponents in and around fishery reserves	Fisheries and Aquatic Resources Act No. 2 of 1996	Clearance	Director of Fisheries and Aquatic Resources
	All subcomponent in proximity of archaeological reserves	Antiquities Ordinance No. 9 of 1940 as amended	Clearance	Department of Archaeology

CCD= Coastal Conservation Department, CEA = Central Environment Authority, EC = Environmental Clearance, NEA = National Environment Act, UDA = Urban Development Authority.

23. **Table 5** summarizes the application procedures for the main environmental permits.

Table 5: Summary of Procedure for Obtaining Environmental Permits Required by Government of Sri Lanka

Legislation	Regulatory, Agency	Summary of Procedure	Time scale			
1. Central Environmental Authority - Environment Impact Assessment/Initial Environmental Examination (IEE/EIA) Clearance						
National Environmental Act	Central	1. Proponent to submit Project	During			
No. 47 of 1980 and amended	Environmental	Information Document to CEA	Feasibility Stage			

Legislation	Regulatory, Agency	Summary of Procedure	Time scale
Act No. 56 of 1988; Government Gazette No. 772/22 of 24th June 1993 and No. 859/14 of 23rd February	Authority (CEA)	 CEA to designate Project Approving Authority (PAA) PAA to appoint scoping committee; Issue of Terms of Deferences (TaB) for the ELA (IEE) 	36 days
1990		4. Proponent to conduct the environmental assessment and submit report to PAA	One and half years
		5. PAA to check adequacy	14 days
		6. For EIA, report will be open for public comments	30 days
		 Technical Review Committee (TRC) to review report and forwarding comments PAA to recommend to CEA issuance of Clearance 	36 days
2. Coast Conservation Depar	tment Permit		
Under Section 5, 14, 15 and 16 of Coast Conservation Act No. 57 of 1981	Coast Conservation Department	1. Proponent to submit application to CCD 2. CCD to issue ToR for FIA/IFF	During Feasibility Stage
	(CCD)		About 14 days
	X ,	3. Proponent to conduct the environmental assessment and submit report to CCD	One and half years
		 4. For EIA, CCD will (i) invite Coast Conservation Advisory Council for comments; and (ii) open report for public comments 5. CCD to review comments 6. CCD to issue permit 	120 days (maximum)
3. Environmental Protection	License (EPL)		
National Environmental Act No. 47 of 1980 amended by Acts No. 56 of 1988 and No. 53 of 2000; Gazette Notification No. 1533/16 dated	CEA	 Proponent to submit application to CEA CEA to conduct field inspection and verification from relevant authorities 	Minimum of 30 days prior to the commencement of operation 14 days
25.01.2008		CEA to prepare Inspection Report with Recommendations TRC to review report Proponent to pay license fee CEA to issue EPL	14 days
4. Archaeological Impact Ass	sessment Surv	еу	
Under Section 47 read with Section 43(b) of Antiquities (Amendment) Act No. 24 of	Department of Archaeology	Proponent to submit application to Department of Archaeology. DA Regional Office to conduct	During Feasibility Stage

Legislation	Regulatory, Agency	Summary of Procedure	Time scale
1998; Gazette Notification No. 1152/14 dated 04.10.2000		Preliminary Observation and submit report to Department of Archaeology. (i) If there are no antiquities according to the recommendation and observation report, land will be	About 30 days
		released for the project. (ii) If the preliminary observation report has proposed to carry out an archaeological impact assessment survey, steps will be taken to conduct the survey including scoping with other agencies. Department of Archaeology to call for quotations and award contract for Archaeological Impact Assessment (AIA) survey	30 days
		Selected agency to conduct AIA survey and submit report to Department of Archaeology	42 days
		Department off Archaeology to submit AIA report to Minister in charge of approval Department of Archaeology to issue approval	About 30 days
5. Clearance from Departmer	nt of Forest Co	nservation	
Under the ordinance enacted in 1907 No. 16, and subsequent amendment No. 23, 1995 and No. 65 of 2009.	Department of Forest Conservation (DFC)	Proponent to submit application to DFC	During Feasibility Stage
		District Forest Office along with the DFC officials to conduct preliminary observation and submit report to Conservator General of DFC for approval	About 60 days
		(i) If the project is located within the core protected area, the application will be rejected;	60 days
		If the project will utilize resources from the forest (timber or related) the application will be rejected (even if it is located outside the boundary and the buffer);	
		If the project is outside the boundaries and buffers of any Forest Reserves (FRs), DFC"s consent will be released. DFC will refer to CEA if the	30 davs

Legislation	Regulatory, Agency	Summary of Procedure	Time scale
		proposed activities will cause	
		negative impacts on forest	
		conservation areas and there will be	
		extraction of resources involved.	
		- Under NEA, EIA will be conducted	116 days
		 DFC will become the project 	
		approving agency	
		DFC will release the approval with	
		the concurrence of the CEA.	

Notes: CEA = Central Environmental Authority, PAA = Project Approving Agency, CCD = Coast Conservation Department, ToR =Terms of Reference, EPL = Environment Protection License, EIA = Environmental Impact Assessment, IEE = Initial Environmental Examination, DA =Department of Archaeology, AIA = Archaeological Impact Assessment, UDA= Urban Development Authority, SLLR&DC = Sri Lanka Land Reclamation and Development Corporation, DFC = Department of Forest Conservation.

2.3 Applicable International Environmental Agreements

24. In addition to national laws and regulations, international conventions such as the International Union for Conservation of Nature and Natural Resources (IUCN), Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), Convention on Migratory Species of Wild Animals (CMS) and Ramsar Convention on Wetlands of International Importance etc. are applicable for selection and screening of subprojects under restricted/sensitive areas. Sri Lanka is a party to these conventions.

25. International Union for Conservation of Nature and Natural Resources (IUCN). The IUCN Red List of Threatened Species (also known as the IUCN Red List or Red Data List), founded in 1963, is a comprehensive inventory of the global conservation status of plant and animal species. The IUCN is an authority on the conservation status of species. A series of Regional Red Lists are produced by countries or organizations, which assess the risk of extinction to species within a political management unit. The IUCN Red List is set upon precise criteria to evaluate the extinction risk of thousands of species and subspecies. These criteria are relevant to all species and all regions of the world. The aim is to convey the urgency of conservation issues to the public and policy makers, as well as help the international community to try to reduce species extinction.

26. **Convention on Migratory Species of Wild Animals (CMS).** CMS was adopted in 1979 and entered into force on 1 November 1983. CMS, also known as the Bonn Convention, recognizes that local authorities must be the protectors of migratory species that live within or pass through their national jurisdictions, and aim to conserve terrestrial, marine, and avian migratory species throughout their ranges. Migratory species threatened with extinction are listed on Appendix I of the Convention. CMS parties strive towards strictly protecting these species, conserving or restoring the places where they live, mitigating obstacles to migration and controlling other factors that might endanger them. Migratory species that need or would significantly benefit from international cooperation are listed in Appendix II of the Convention, and CMS encourages the range states to conclude global or regional agreements.

27. Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES). It is an international agreement between governments. Its aim is to ensure that international trade in specimens of wild animals and plants does not threaten their survival.

CITES was first formed, in the 1960s. Annually, international wildlife trade is estimated to be worth billions of dollars and includes millions of plant and animal specimens. The trade is diverse, ranging from live animals and plants to a vast array of wildlife products derived from them, including food products, exotic leather goods, wooden musical instruments, timber, tourist curios and medicines. Levels of exploitation of some animal and plant species are high and the trade in them, together with other factors, such as habitat loss, is capable of heavily depleting their populations and even bringing some species close to extinction. Many wildlife species in trade are not endangered, but the existence of an agreement to ensure the sustainability of the trade is important in order to safeguard these resources for the future. Because the trade in wild animals and plants crosses borders between countries, the effort to regulate it requires international cooperation to safeguard certain species from over-exploitation.

28. **Ramsar Convention on Wetlands of International Importance 1971.** The Convention on Wetlands of International Importance, called the Ramsar Convention, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. The Ramsar Convention is an international treaty for the conservation and sustainable utilization of wetlands The Ramsar Convention is the only global environmental treaty that deals with a particular ecosystem. According to the Ramsar list of Wetlands of International Importance, there are five designated wetlands in Sri Lanka that need to be protected. Activities undertaken in the proximity of Ramsar wetlands shall follow the guidelines of the convention. Sri Lanka presently has 5 sites designated as Wetlands of International Importance, with a surface area of 32,372 hectares.

29. United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Convention. The most significant feature of the 1972 World Heritage Convention is that it links together in a single document the concepts of nature conservation and the preservation of cultural properties. The Convention recognizes the way in which people interact with nature, and the fundamental need to preserve the balance between the two. The convention defines the kind of natural or cultural sites, which can be considered for inscription on the World Heritage List. The convention sets out the duties of states parties in identifying potential sites and their role in protecting and preserving them. By signing the Convention, each country pledges to conserve not only the World Heritage sites situated on its territory, but also to protect its national heritage. The states parties are encouraged to integrate the protection of the cultural and natural heritage into regional planning programs, set up staff and services at their sites, undertake scientific and technical conservation research, and adopt measures, which give this heritage a function in the day-to-day life of the community. It also encourages states parties to strengthen the appreciation of the public for World Heritage properties and to enhance their protection through educational and information programs.

2.4 Asian Development Bank's Safeguards Policies

30. Safeguard Policy Statement 2009 of ADB, its procedures and guidelines thereto apply to all components/subprojects funded by ADB. The Environment Assessment and Review Framework (EARF) guidelines applicable to this Tranche for project selection are also summarized in **Table 4** above.

2.5 Other documents relevant to ADB's Safeguard Policy Statement, 2009

31. World Bank Group's Environment, Health and Safety (EHS) Guidelines, 2007 (currently under revision).

(i) Environmental, Health, and Safety Guidelines for Electric Power Transmission and Distribution.

32. ADB's Environmental Safeguards: A Good Practice Sourcebook-Draft Working Document (November 2012).

33. ILO Core Labor Standards.

3.0 DESCRIPTION OF THE PROJECT

3.1 The Project

34. The medium-voltage network efficiency improvement of the Green Power Development and Energy Efficiency Improvement Tranche 2 Program consists of:

D-1	Construction of a new 23 km 33 kV from Old Anuradhapura Grid Substation (GSS) to
	Mahailuppallama Gantry
D-2	Gantry at Mahailuppallama
D-3	Construction of a new 4 km 33 kV line from Ethgala Gantry to Storefield Gantry
D-4	Gantry at Ethgala
D-5	Construction of a new 8 km 33 kV line from Kappalthurai GSS to Chinabay Gantry
D-6	Gantry at Chinabay
D-7	Augmentation of Ethulkotte Power Substation (PSS)
D-8	Construction of a new 11 km 33 kV line from Embilipitiya GSS to Weniwelara
D-9	Gantry at Weniwelara
D-10	New PSS at Rattanapitiya
D-11	Augmentation of Beligaha PSS
D12	Construction of a new 14 km 33 kV line from Matugama GSS to Bentota PSS

35. To improve medium voltage (MV) network efficiency and provide system capacity to cater for load growth: construction of these express lines provide virtual power injection points to improve reliability, improve line end voltages, reduce MV losses and increase line capacities, while also improving the system operation flexibility. Their details are as follows:

D-1. - Old Anuradhapura GSS to Mahailuppallama Gantry

36. Construction of New 33 kV 23 km DC Lynx Tower line from Old Anuradhapura GSS to Mahailuppallama Gantry will improve the low voltage problem in Mahailuppallama area.

D-2. - Gantry at Mahailuppallama

37. Construction of Two Section Single Busbar Gantry at Mahailuppallama to interconnect 33 kV lines for the low voltage problem in Mahailuppallama area.

D-3. -Storefield Gantry to Ethgala Gantry

38. Construction of New 33 kV 4 km DC Lynx Tower line from Storefield Gantry to Ethgala Gantry to improve the voltage in Ethgala area.

D-4. - Gantry at Ethgala

39. Construction of Two Section Single Busbar Gantry at Ethgala to interconnect 33 kV lines for voltage improvement in Pussallawa area.

D-5. - Kappalthurai GSS to Chinabay Gantry.

40. Construction of New 33 kV 8 km 4cct Lynx Tower line from Kappalthurai GSS to Chinabay Gantry to improve power supply reliability in Chinabay area.

D-6. - Gantry at Chinabay

41. Construction of Two Section Single Busbar Gantry at China Bay to interconnect 33 kV lines for improvement of power supply reliability in Chinabay area.

D-7. - Augmentation of Ethulkotte PSS

42. Augmentation of Ethulkotte Primary Substation - a). augment the PSS by upgrading transformers from 2X10 MVA to 2X16MVA; b). reconstruct the control building and replace 11 kV and 33 kV switch gear and control panels with GIS System; c). implement the Substation Automation System; d). to enhance capacity of the Ethulkotte PSS.

43. This PSS will cater to the increasing supply demand in Battaramulla, Welikada and Kalubowila areas. It will provide highly reliable power supply to critical loads like Parliament, other government offices and commercial establishments with high degree of operational flexibility and distribution automation.

D-8. - Embilipitiya GSS to Weniwelara

44. Construction of New 33 kV 11 km DC Lynx Tower lines from Embilipitiya GSS to Weniwelara Gantry to improve the low voltage problem in Sooriyawewa area.

D-9. - Gantry at Weniwelara

45. Construction of Two Section Single Busbar Gantry at Weniwelara to interconnect 33 kV lines for improvement of power supply reliability in Sooriyawewa area.

D-10. - New PSS at Rattanapitiya

46. Construction of New Primary Substation at Rattanapitiya with 2x10 MVA transformers and 6 Nos. of 11 kV Outgoing feeders to accommodate the anticipated load growth including town development requirements of Nugegoda, Boralesgamuwa and Maharagama areas which is fed by LECO and the requirements of the proposed Educational area of the University of Sri Jayawardenapura etc.

D-11. - Augmentation of Beligaha PSS

47. Augmentation of Beligaha Primary Substation (PSS) by upgrading transformers from 2X5MVA + 2MVA to 2X10MVA and reconstruction of the control building and replace 11 kV and 33 kV switch gear and control panels with GIS System. This will cater to the increasing supply demand in Galle, Dadalla and Karapitiya areas and to provide high degree of reliability and operational flexibility of the MV network in the Southern Province.

D12. - Matugama GSS to Bentota PSS

48. Construction of New 33 kV 14 km DC Lynx Tower line from Matugama GSS to Bentota PSS to improve power supply reliability in Bentota Tourism area.

3.2 Type of Project

49. With the proposed new 33 kV tower lines, 33 kV backbone network will be strengthened, reducing the line loading and losses and improving the voltage profile of the distribution system. Loss saving and the voltage improvement with and without proposed facilities are given **Table 6** and **Table 7** below.

Project	Lynx Tower Line Description	Losses(kWh)		
		With line	Without line	Loss saving
D-1	Old Anuradhapura GS to Mahailluppalama Gantry	2,452,900	3,520,700	1,067,800
D-3	Ethgala Gantry to Storefield Gantry	8,392,080	9,294,360	902,280
D-5	Kappalthurai GS to Chinabay Gantry	2,579,732	12,941,586	10,361,854
D-8	Embilipitiya GS to Weniwelara Gantry	11,554,463	12,742,673	1,188,210
D-12	Matugama GS to Bentota PS	4,201,129	5,600,532	1,399,403

Table 6: Distribution Line Losses with and without proposed New 33 kV Tower Lines -
Year 2017

Table 7: Voltage profile with and without proposed New 33 kV Tower Lines - Year 2017

Project	Lynx Tower Line Description	Voltage Profile		
		With line	Without line	Voltage Improvement (%)
D-1	Old Anuradhapura GS to Mahailluppalama Gantry	98	92.7	5.3
D-3	Ethgala Gantry to Storefield Gantry	98.2	93.0	5.2
D-5	Kappalthurai GS to Chinabay Gantry	97	76	21
D-8	Embilipitiya GS to Weniwelara Gantry	98	91.4	6.6
D-12	Matugama GS to Bentota PS	99.8	92.9	6.9

3.3 Justification for the Project

3.3.1 D-1. - Old Anuradhapura GSS to Mahailuppallama Gantry

50. Mahailuppallama area having major loads such as Mahailuppallama farm area, Eppawala Phosphate etc. is presently fed by a 17 km long 33 kV feeder from Habarana Grid Substation. The voltage profile in Mahailuppallama area is found to be 92.7%, which is below the standard voltage regulation of the distribution network ($\pm 6\%$). To overcome the above issue, the proposed 23 km long, 33 kV feeder from Old Anuradhapura GS by the year 2016 is identified. With the introduction of the proposed connection, 33 kV backbone network in the North Central Province will be strengthened and the voltage will improve to 98% in Mahailuppallama Area.

3.3.2 D-2. - Gantry at Mahailuppallama

51. The 33 kV switching gantry at Mahailuppallama area is proposed to connect the proposed backbone line from Old Anuradhapura GS to the existing MV network in order to

improve the operating flexibility of the MV distribution system in the North Central Province. This proposed gantry is expected to improve the MV tail end line voltage level from 92.7% to 98%. The estimated annual energy savings is 1,067 MWh benefiting about 31,200 consumers.

3.3.3 D-3. - Storefield Gantry to Ethgala Gantry

52. Pussallawa area having major loads such as Tea factories, Crisbo Farm etc. is fed from Storefield Gantry which is presently connected to Gampola Gantry through a 33 kV feeder. The voltage profile in Pussallawa area is found to be 93% which is below the standard voltage regulation of the Distribution network. An additional 33 kV 4 km DC Lynx Tower line from the proposed Ethgala Gantry to Storefield Gantry is identified by the year 2016 in order to provide a shorter interconnection to medium voltage network, thus eliminating the low voltage issue. With the introduction of the proposed inter-connection, 33 kV backbone network in the Central Province will be expanded and the voltage will improve to 98.2% in Pussallawa Area.

3.3.4 D-4. - Gantry at Ethgala

53. The proposed 33 kV switching gantry at Ethgala is to interconnect the proposed line from Storefield Gantry to Ethgala Gantry in order to improve the operating flexibility of the MV distribution system in the Central Province. This proposed gantry is expected to improve the MV tail end line voltage level from 93% to 98.2%. The estimated annual energy savings is 6894 MWh benefiting about 82,400 consumers.

3.3.5 D-5. - Kappalthurai GSS to Chinabay Gantry.

54. The present annual energy demand in Trincomalee/Chinabay tourist area is 153.9 GWh with major loads such as Tokyo Super, Prima, Government industries and Industrial Development Projects etc. An adequate and reliable electricity supply is a pre-requisite for maintaining above social and economic surrounding. Chinabay area is presently fed by 45 km long, 33 kV feeder from Trincomalee GS and there is no alternative supply arrangement in case of an outage.

55. The proposed 33 kV feeder with four circuits from Kappalthurai GS to Chinabay area is identified in order to improve the supply reliability and enhance the loading capacity. With the introduction of the proposed feeder, 33 kV backbone network in the Eastern Province will be expanded, thus reducing the system losses, improving the voltage profile and supply reliability. It is expected to improve the MV tail end line voltage level from 76% to 95%. The estimated annual energy savings is 1,882 MWh benefiting about 38,500 consumers.

3.3.6 D-6. - Gantry at Chinabay

56. The proposed 33 kV switching gantry at Chinabay Area is to connect the proposed backbone line from Kappalthurai GS to the existing MV network in order to improve the operating flexibility of the MV distribution system in the Eastern Province. This proposed gantry is expected to improve the MV tail end line voltage level from 76% to 95%. The estimated annual energy savings is 1,882 MWh benefiting about 38,500 consumers.

3.3.1 D-7. - Augmentation of Ethulkotte PSS

57. Augmentation of Ethulkotte Primary Substation is proposed to enhance the supply capacity of the Ethulkotte PSS which presently feeds Battaramulla, Welikada and Kalubowila

areas. Power distribution in the western costal belt of the Island from Negombo to Galle and some of the areas in Colombo is carried out by Lanka Electricity Company (LECO). These LECO loads are fed through CEB Primary Substations (33/11 kV) with the distribution voltage level of 11 kV.

58. Ethulkotte Primary Substation supplies both LECO and CEB areas including the Parliament of Sri Lanka as a major customer of CEB. It was established in 1986 with 2X10 MVA capacity and it is now more than 30 years old. Latest MV development studies revealed the augmentation of Ethulkotte PS is very essential to cater to the increasing demand of LECO and CEB customers and to improve the reliability of supply.

59. According to the present 11 kV feeder loadings, the firm capacity of the PS exceeds during the day peak loading scenario. A distribution project for undergrounding in Battaramulla area is under implementation and it is also fed by Ethulkotte PSS. Further, according to the city development plans of Sri Lanka, several bulk loads are to be added to the distribution network in the near future. According to LECO load forecasts, the future demand of LECO feeders is expected to increase at a considerable growth rate.

60. Following operational issues of Ethulkotte PSS have been observed due to aging of equipment and frequent breakdown and maintenance activities.

- 11 kV switchgear panels and related spares are now out of production.
- Transformer ON Load Tap Changer controllers are not functioning properly.
- Present control room is in very poor condition and floor settlements and panel misalignments could be observed.

61. Therefore, the reliability and the capacity of the PSS should be improved to cater to the future power demand. Further, old equipment have to be replaced in order to make them compatible with the new technologies to operate the PSS via Distribution Control Centers

3.3.2 D-8. - Embilipitiya GSS to Weniwelara

62. In line with the Government objectives to develop regional economies, major development projects in the Southern Provence such as Mattala airport, Hambantota port etc. have taken place in the recent past. The MV network has been extended to greater distances to reach rural population thus resulting in increased 33 kV line losses and voltage drops in the distribution system.

63. Sooriyawewa area having major loads such as Sooriyawewa Cricket Ground, Sooriyawewa Water Treatment Plant etc. is presently fed by 30 km long, 33 kV feeder from Hambantota GS. The voltage profile in Sooriyawewa, Kataragama, Yala areas which are fed by Hambantota GS is found to be 91.4% which is below the standard voltage regulation of the Distribution network. With the expected domestic & commercial load growth of 11% and industrial load growth of 9%, low voltage situation will become critical if the existing network is not enhanced. To mitigate the above issue, MV Development Plan 2015-2024 has identified the requirement of an additional feeder of 14 km long from Embilipitiya GS to Sooriyawewa by the year 2019. With the introduction of the proposed connection, 33 kV backbone network in the Southern Province will be expanded, thus reducing the system losses, improving the voltage profile and supply reliability.

3.3.3 D-9. - Gantry at Weniwelara

64. 33 kV Tower line proposed from Embilipitiya GSS will be terminated at Weniwelara Gantry in order to improve the reliability of Sooriyawewa area and the operating flexibility of the MV system in the Southern Province. This proposed gantry is expected to improve the MV tail end line voltage level from 91.4% to 98.0%. The estimated annual energy savings is 1,399 MWh benefiting about 30,000 consumers.

3.3.4 D-10. - New PSS at Rattanapitiya

65. MV Development Studies have identified the need for constructing a new 2x10 MVA 33 kV/11 kV GIS Primary Substation at Rattanapitiya with six 11 kV out going feeders. The main purpose of the construction of this PSS is to cater to the anticipated demand growth in Nugegoda, Boralesgamuwa and Maharagama areas. Electricity distribution in these areas is carried out by LECO. In addition to LECO loads, the electricity supply requirements of proposed educational establishments of University of Sri Jayawardenapura could also be met with this new Primary Substation.

66. Establishment of this Primary Substation will improve the network reliability with additional alternate feeding arrangements in the Western Province (South). Introduction of this Primary Substation will reduce the burden of some of the existing Primary Substations as well as 11 kV feeders by sharing the loads which will also improve the reliability and operational flexibility of the MV network. With this new PSS, approximately 10,000 customers will be fed after completion.

3.3.5 D-11. - Augmentation of Beligaha PSS

67. 33 kV/11 kV, 2x5MVA Beligaha Primary Substation is 30 years old and it supplies mainly LECO loads in Galle area. This was operated as a manned Primary Substation until year 2008. It was observed that the walls and foundations of the control building were cracked and slanted due to uneven settling of ground. Further, the equipment of PSS was at risk of being submerged due to collection of storm water during heavy rains. Hence, it was converted to an unmanned PSS in year 2008 as a temporary measure and the control room building was abandoned.

68. Operational issues have been observed due to aging of equipment and frequent breakdown and maintenance activities. Auto recloser as only protective devices has resulted in reducing the reliability of the electricity supply and safety of the equipment/public considerably.

69. According to CEB & LECO load forecasts, the anticipated demand in Galle area increases at a considerable growth rate. Hence, an additional 2MVA, 33 kV/11 kV transformer was added to this unmanned PSS in year 2014. CEB & LECO loads in Galle area are presently fed by both Beligaha and Dadalla PSS on sharing basis. Dadalla PSS is also an un-manned primary substation with inadequate protection devices, thus reducing supply reliability and public safety.

70. A new manned PS at Minuwangoda was proposed to feed Galle area under LECO Supply Source Enhancement Project (LSSEP) which is under implementation with CEB funds. However, land procurement could not be finalized due to the scarcity of lands in the vicinity of the load centers.

71. Under above circumstances, the capacity of the Beligaha PSS is required to be

increased in order to cater to the expected load growth with enhanced reliability in the distribution network. Accordingly, it is proposed to augment the existing 12 MVA unmanned PSS in Beligaha to 2x10 MVA, GIS manned PSS by the year 2019.

3.3.6 D-12. - Matugama GSS to Bentota PSS

72. The present annual energy demand in Bentota tourist area is 18,921 GWh. with major loads such as Sri Lanka Telecom, tourist hotels and resorts and LECO loads etc. Hence, an adequate and reliable electricity supply is a pre-requisite for maintaining above social and economic surrounding.

73. Bentota Tourism area is presently fed from Ambalangoda GS and there is no alternative supply arrangement in case of an outage. The proposed feeder of same length from Matugama GSS to Bentota area is identified in order to improve the supply reliability. It is expected to improve the MV tail end line voltage level from 92.9% to 99.8%. The estimated annual energy savings is 1,188 MWh benefiting about 25,500 consumers.

3.4 Location

74. The proposed sub-projects are located in different areas of the country including Northern, Northern Central, Central, and Eastern provinces. **Table 8** indicates details of the proposed sub-project locations and **Table 9** gives the land ownership details for gantry based switching stations.

	Sub-project	CFB	DS division	District	Province
		Regio		District	
		n			
D-1	Old Anuradhapura GSS to	DD1	Mihintale,	Anuradhapur	North- Central
	Mahailuppallama Gantry 23 km		Tirappane, Kekirawa	а	
D-2	Gantry at Mahailuppallama	DD1	Kekirawa	Anuradhapur	North-Central
				а	
D-3	Ethgala Gantry to Storefield	DD2	Udapalatha/	Kandy	Central
	Gantry – 4 Km	000	Gampola	Karaka	Operatural
D-4	Gantry at Etngala	DD2	Gampola	Kandy	Central
D-5	Kappalthurai GSS to	DD2	Trincomalee	Trincomalee	Eastern
	Chinabay Gantry-8 km		Town/ Four		
			Gravets		
D-6	Gantry at Chinabay	DD2	Trincomalee	Trincomalee	Eastern
			town		
D-7	Augmentation of Ethulkotte	DD3	Nugegoda	Colombo	Western
	PSS				
D-8	Embilipitiya GSS to	DD4	Embilipitiya,	Ratnapura,	Sabaragamuw
	Weniwelara – 11 km		Sooriyawewa	Hambantota	a, Southern
D-9	Gantry at Weniwelara	DD4	Sooriyawewa	Hambantota	Southern
D-	New PSS at Rattanapitiya	DD4	Kesbewa	Colombo	Western
10					
D-	Augmentation of Beligaha	DD4	Galle	Galle	Southern

Table 8: Different Locations of Proposed Subprojects.

	Sub-project	CEB Regio n	DS division	District	Province
11	PSS				
D12	Matugama GSS to Bentota PSS – 14 km	DD4	Mathugama, Benthota	Kalutara, Galle	Western, Southern

Table 9: Ownership Details Gantry based Switching stations.

	Sub-project	Village/Town Name	Area	Ownership of Land
D-2	Gantry at Mahailuppallama	Mahailuppallama	0.05 ha	Dept. of Agriculture/ Govt.
D-4	Gantry at Ethgala	Ethgala	0.03	Private
D-6	Gantry at Chinabay	Chinabay	0.03	CEB/ Govt.
D-7	Augmentation of Ethulkotte PSS	Ethulkotte	0.02	CEB/ Govt.
D-9	Gantry at Weniwelara	Weniwelara	0.03	Private
D-10	New PSS at Rattanapitiya	Pepiliyana	0.04	Sri Lanka Land Reclamation Development Corporation SLRDC/ Govt.
D-11	Augmentation of Beligaha PSS	Beligaha	0.02	CEB/Govt.

75. **Figure 1** provides general location map for all projects proposed under the loan. **Figures 2-9** provides topographical maps (on 1:50,000 scale) that show the proposed distribution line routes for the following sub-projects as shown in **Table 10**:

Table 10: List of Figures

	Sub-project	Figure #
	Location of all projects on Sri Lanka Map	Figure 1
D-1	Old Anuradhapura GSS to Mahailuppallama Gantry	Figure 2
D-2	Gantry at Mahailuppallama	Figure 3
D-3	Ethgala Gantry to Storefield Gantry	Figure 4
D-4	Gantry at Ethgala	Figure 5
D-5	Kappalthurai GSS to Chinabay Gantry.	Figure 6
D-6	Gantry at Chinabay	Figure 7
D-7	Augmentation of Ethulkotte PSS	Figure 8
D-8	Embilipitiya GSS to Weniwelara	Figure 9
D-9	Gantry at Weniwelara	Figure 10
D-10	New PSS at Rattanapitiya	Figure 11
D-11	Augmentation of Beligaha PSS	Figure 12
D12	Matugama GSS to Bentota PSS	Figure 13



Figure 1: Map of Sri Lanka including location details of Proposed Tranche 2 Projects

Figure 2: D-1 Route Map of 33 kV 23 km DC Lynx Tower line from Old Anuradhapura GSS to Mahailuppallama Gantry

Figure 3: D-2. –Land for the proposed Gantry at Mahailuppallama, near existing 33 kV pole line.



Figure 4: D-1. - D-3. Route Map 33 kV 4 km DC Lynx Tower line from Storefield Gantry to Ethgala Gantry


Figure 5: D-2. - D-4. - Land (private) for the proposed Gantry at Ethgala

Figure 6: D-5. - Route Map of 33 kV 8 km 4cct Lynx Tower line from Kappalthurai GSS to Chinabay Gantry





Figure 7: D-6. – Land (Govt.) for the proposed Gantry at Chinabay

Figure 8A: Ethulkotte PSS and CEB building adjacent to the Parliament road





Figure 8B: D-7. - Ethulkotte Primary substation and the CEB building

Figure 9: D-8. - Route Map of 33 kV 11 km DC Lynx Tower lines from Embilipitiya GSS to Weniwelara Gantry







Figure 11A: Land for the proposed gantry- Rattanapitiya



Figure 11: D-10. – Land for the New PSS at Rattanapitiya



Figure 12A: D-1. - Augmentation of Beligaha PSS





Figure 12B: D-1. - Augmentation of Beligaha PSS



Figure 13: D-2. - Route Map of 33 kV 14 km DC Lynx Tower line from Matugama GSS to Bentota PSS

3.5 Size and the Magnitude of the Operation

Туре	Length (km)	No of Towers
33 kV Lynx DC Tower	23 km	72 towers

D-1. - Old Anuradhapura GSS to Mahailuppallama Gantry

76. The 23 km, 33 kV distribution line from Old Anuradhapura GSS to Mahailuppallama gantry traverse paddy fields, home gardens, scrublands, chena and degraded lands. About 50% of the line (11.43 km) is over the paddy fields, 5.87 km in scrubland/ degraded forestlands, 4.43 km in home gardens, and 0.97 km in marshy areas and over the water bodies. Temporary impacts are foreseen on loss of paddy crop during construction and loss of some trees (266) is also anticipated. This is a distribution line and the impacts are quite limited since the right of way is minimal. Line crosses Kuda Nelumkulama road, Keerikulama tank, Yahalegama-Nachchaduwa road, Nilbewa- Nachachaduwa road, Kongaswewa road towards Tirappane, Selesthimaduwa, Vettanlulama, Karuwalagaswewa, near Kalawewa- Nachchaduwa canal, crosses Tirappane- Eppawala road, Nallamudawa, Ihalagama, Puliyankulama, and it crosses Jaya Ganga between AP18-19. The line has approximately 72 nos. lattice towers³ and the conductors shall be single Lynx per phase, double circuit line.

D-2. - Gantry at Mahailuppallama

Туре	Gantry Area (perches)*		
2SSBB (Structural)	10 perches=252 sq,m.		
* 1 perch is equal to 25.29285264 square meter.			

77. The land identified for the Mahailuppallama gantry comes under the Department of Agriculture. CEB will get the land (0.03 Ha) transferred from the Dept. of Agriculture. The Gantry shall require an area of about 250 sq. m. It has 02 nos. incoming lines and 04 nos. outgoing lines. At the gantry, incoming lines shall be with load break switches and the outgoing lines shall be with auto-reclosures.

D-3. - Ethgala Gantry to Storefield Gantry

Туре	Length (km)	No of Towers
33 kV Lynx DC Tower	4 km	20 towers

78. The 04 km, 33 kV distribution line from Storefield gantry to proposed Ethgala gantry traverses through home gardens, grasslands, tea smallholdings, and open/ degraded lands. It crosses Mahaweli River between Angle Point (AP) 3 and AP 4. The line travels parallel to the existing 33 kV line at Hakwalapatana village and Hopewell colony. The number of trees to be cut down for RoW is 97 for the line. The length of line through home gardens/ tea cultivation is 2.15 km and 0.86 km through uncultivated areas/ scrublands. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. Approximately the line has 20 nos. lattice towers⁴ and the conductors shall be single Lynx per phase double circuit line.

³ Calculated on basis of @5 towers per km line).

⁴ Calculated on basis of @5 towers per km line).

D-4. - Gantry at Ethgala

Туре	Gantry Area (perches)*			
2SSBB (Structural)	10 perches=252 sq,m.			
* 1 perch is equal to 25.29285264 square meter.				

79. The land identified for the construction of Ethgala Gantry is a private land for which consent has already been submitted by the landowner. The land is uncultivated and few trees are found. CEB will require 0.03 ha land for the gantry. The Gantry shall require an area of about 250 sq. m. It has 02 nos. incoming lines and 04 nos. outgoing lines. At the gantry, incoming lines shall be erected with load break switches and the outgoing lines shall be with auto-reclosures.

D-5. - Kappalthurai GSS to Chinabay Gantry.

Туре	Length (km)	No of Towers
33 kV Lynx 4 cct. DC Tower	6 km	23 towers

80. The 6 km, 33 kV distribution line from Kappalthurai GSS to China Bay gantry traverses 80% through teak plantations/dry-mixed evergreen forest and scrublands while the rest passes through home gardens and paddy fields. The line travels parallel to the railway line and passes through villages such as Kappalthurai and Sardhapura. This is a distribution line and the impacts are quite limited since the right of way is minimal. Temporary impacts are foreseen and loss of some trees (553) is also anticipated. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of RoW. Approximately the line has 23 nos. lattice towers⁵) and the conductors shall be single Lynx per phase double circuit line.

D-6. - Gantry at Chinabay

Туре	Gantry Area (perches)*			
2SSBB (Structural)	10 perches=252 sq,m.			
* 1 perch is equal to 25.29285264 square meter.				

81. The land allocated for China Bay gantry is a government land (0.03 Ha) which belongs to the Ports Authority where the oil tanks are located in Tricomalee. Teak trees are found in the site which were planted by the Forest Department. In addition, natural vegetation, dry-mixed evergreen forest are also found in the site. The gantry shall require an area of about 250 sq. m. It has 02 nos. incoming lines and 04 nos. outgoing lines. At the gantry, incoming lines shall be with load break switches and the outgoing lines shall be with auto-reclosures.

D-7. - Augmentation of Ethulkotte PSS

82. It is a CEB Owned Property.

PSS Augmentation PSS Existing Land of Ethulkotte PSS NA

⁵ Calculated on basis of @5 towers per km line).

D-8. - Embilipitiya GSS to Weniwelara

Туре	Length (km)	No of Towers
33 kV Lynx DC Tower	11 km	42 towers

83. The 11 km, 33 kV distribution line from Embilipitiya GSS to Weniwelara gantry traverses through paddy fields, home gardens, scrublands/ forest, riverine vegetation at Walawe River, banana plantations and open areas/ degraded lands.

84. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of RoW. The most part of the RoW is in paddy fields. Approximately the line has 42 Nos. lattice towers⁶ and the conductors shall be single Lynx per phase double circuit line.

D-9. - Gantry at Weniwelara

Туре	Gantry Area (perches)*		
2SSBB (Structural)	10 perches=252 sq,m.		
* 1 perch is equal to 25.29285264 square meters.			

85. The gantry is proposed on a private land (0.03 ha) in an edge of a paddy field. CEB is negotiating with the owner to purchase the land. Gantry shall require an area of about 250 sq. m. It has 02 nos. incoming lines and 03 nos. outgoing lines. At the gantry, incoming lines shall be erected with load break switches and the outgoing lines shall be with auto-reclosures.

D-10. - New PSS at Rattanapitiya

New PSS	PSS	40 perches	NA

86. The main purpose of the construction of Rattanapitiya PSS is to cater for the anticipated demand growth in Nugegoda, Boralesgamuwa and Maharagama areas. A 0.1 ha (40 perches) land belonging to the SLRDC was selected. This is located close to the main road from Dehiwala to Nugegoda near Pepiliyana Bridge which was renovated recently. The land is along the main canal reconstructed to prevent the flooding of the area. At present people cultivate vegetables/ paddy in this area and only a small portion would be acquired for the Primary Substation. A letter was sent to Sri Lanka Land Reclamation and Development Corporation (SLRDC) requesting for an identified land for the new PSS

D-11. - Augmentation of Beligaha PSS

PSS	Augmentation	-CEB	PSS	Existing Land of Beligaha PSS	NA
Owne	d Property				

87. This primary substation is situated near Beligaha junction of Galle- Baddegama road. The land area is about 0.1 ha. It is water logged during the heavy rain. The augmentation works will increase the capacity up to 20 MVA from 12 MVA. Also, it will increase the level of the land to avoid water logging in the area.

⁶ Calculated on basis of @5 towers per km line).

D-12. - Matugama GSS to Bentota PSS

Туре	Length (km)	No of Towers
33 kV Lynx DC Tower	14 km	56 towers

88. The 14 km, 33 kV distribution line from Matugama GSS to Bentota PSS traverses through paddy fields, home gardens, coconut and oil palm plantations, marsh lands, mangrove areas near Polduwa and degraded lands. The line crosses the expressway (Colombo- Galle), Bentara River and the Galle road before reaching the Bentota PSS. No wildlife sanctuary, national parks or ecologically sensitive areas are present in the nearby area of ROW. The subproject involves construction of 56 lattice towers⁷ with Lynx conductor double phase circuit line.

3.6 Implementation Plan

89. The total cost for construction of above medium-voltage network efficiency improvement is USD 29.34 million. The proposed overall project implementation schedule is attached in **Table 11**.



Table 11: Overall Project Implementation Schedule

Source (s): Asian Development Bank

The bar charts (Black and Grey) denote intermittent activity

⁷ Calculated on basis of @5 poles per km line).

4.0 DESCRIPTION OF ENVIRONMENT (BASELINE DATA)

4.1 Anuradhapura District

No.	List of Subprojects in the Area
D-1	Old Anuradhapura GSS to Mahailuppallama Gantry
D-2	Gantry at Mahailuppallama

4.1.1 Physical Resources

4.1.1.1 Topography, Geology and Soil

90. Anuradhapura is one of the ancient capitals of Sri Lanka, famous for its well-preserved ruins of ancient Sri Lankan civilization. The city, now a UNESCO World Heritage Site, lies 205 km north of the current capital Colombo in Sri Lanka's North Central Province, on the banks of the historic Malvathu Oya. It is one of the oldest continuously inhabited cities in the world and one of the eight World Heritage Sites of Sri Lanka. From the 4th century BC, it was the capital of Sri Lanka until the beginning of the 11th century AD. During this period, it remained one of the most stable and durable centres of political power and urban life in South Asia. The ancient city, considered sacred to the Buddhist world, is today surrounded by monasteries covering an area of over 40 km². **Figure 14** shows the district location.



Figure 14: District map of Anuradhapura

4.1.1.2 Water Resources

91. The total area of the district is 7,179 km². Of these 6,664 km² comprises of terrestrial lands and rest 515 km² is covered by inland waters. This 515 km² extend of inland waters consists of 2600 small, intermediate and large-scale tanks. Major water resources of district are Kala Oya, Mee Oya, Yan Oya and Malwathu Oya. In addition to Oyas, 14 large-scale tanks, 79 medium scale tanks and 2510 small tanks are located in the district. The soil of the district is highly fertile due to reddish brown earth, low humid clays, and alluvial soil.

4.1.1.3 Climate

92. The west part of the district, receives very less precipitation (1000 mm-1500 mm) than east part of district (1500-2000 mm). Highest precipitation is received in inter monsoon period from October to December. Throughout the year district has high temperature (29°C - 30°C). But, from December to January, temperature goes down to 26 °C.

4.1.2 Social and Cultural Development

93. Anuradhapura district is the capital of northwestern province, which consists of 22 DS Division, 18 local government authority and 694 Gramaniladari Divisions.

4.1.2.1 Population

94. The population of the Anuradhapura district by 2008 amounted to 886,945. The population density of Anuradhapura district is 100/km². The male population representing 49.04% amounts to 434,936 persons. The female population accounts for 452,009. On a community basis, Sinhalese accounts for 808,859 persons. This is 91.20% of the total population of the district. Muslims accounts for 72,289 persons and Tamils accounts for 4,502 persons. A minority of 1,295 persons belong to other religions. In categorizing the population on the basis of religions, 803,459 persons are Buddhists, 72,328 belong to Islam and Hindus and Christians account for 3844 and 7128 respectively.

4.1.2.2 Employment

95. 24,592 of the population are employed in various industries. 7,632 persons are employed in 3,453 small-scale industries, while 9,710 persons are employed in 53 large-scale industries.

4.1.3 Economic Development

96. For the economic development of the district, there are 55 State financial institutions and 110 private institutions. In the year 2008, 812,554 hectares were cultivated in the Anuradhapura district and the paddy harvest accrued amounted to 12,357 metric tons. 31,092 main irrigation schemes helped in this regard. In addition to paddy cultivation, a land area of 6324 hectares was cultivated with vegetable, additional crops, and pulses. The harvest reaped from these cultivations amounted to 3,513,000 Kgs. As per the land utilization in the district in the year 2008, 128,719.79 hectares were used for paddy cultivation and 59,084.05 hectares was used for Chena cultivation.

4.1.3.1 Health and Educational Facilities

97. During the last four years, the health sector received unprecedented boost in the Anuradhapura district. Accordingly one surgery hospital, 3 base hospitals, 4 district hospitals, 7 central hospitals, 24 rural hospitals, 20 clinics, were established in the district. The total number of schools in the district amount to 544, with 9,228 teachers serving in these schools. The student population amounts to 174,359 students.

4.1.3.2 Sites of Cultural, Archaeological and Historical Significance

98. Sri Maha Bodhi Tree is the oldest historically authenticated tree in the world (2,250 years). The great ancient Sinhalese Buddhist monuments of Anuradhapura are clustered around this Peepal tree (*Ficus religiosa*) called Sri Maha Bodhi, a sapling of the Peepal Tree at Buddha Gaya, Northern India in whose shelter Gautama Buddha attained supreme enlightenment. The sapling was brought to Sri Lanka by Buddhist nun Sanghamitta, the daughter of King Asoka of India in the 3rd Century B.C. To the north of the well protected and well adorned tree are three great monasteries: the Mahavihara, the Abhayagiri and the Jetavana.

99. Aukana Buddha, the 13 meter high statue carved out of solid granite, goes back to the 5th century, to the reign of King Dathusena (about 50 km south of Anuradhapura). Guard stone at Thuparama Temple is considered to be the oldest dagoba in Sri Lanka and is believed to enshrine the collar bone relic of Lord Buddha. The guard stones like these are generally found in pairs at the entrance to temples, palaces and other revered sites. Isurumuniya Lovers Isurumuniya temple built in the 3rd century B.C. is noted for its rock carvings.

100. Ruwanveli Seya, the most popular stupas at Anuradhapura, Ruwanveli Seya, raised in the 2nd century B.C. this dagoba is supposed to have the perfect water bubble shape. Abhayagiri is the largest monastery complex in the Anuradhapura kingdom. Founded in the second century BC by king Valagamba (also known as Vattagamini Abhaya) was an international institution by the first century AD. Covering an area of 200 ha. the monastery includes full components of a Buddhist temple as well as other buildings. The stupa at Abhayagiri is 108m tall and one of the tallest brick buildings of the ancient world.

101. The finest Buddha sculpture in Sri Lanka, the Samadhi Statue (3rd century AD) is among its many fine stone carvings. Ritigala, a beautifully paved footpath, several elevated platforms, ruins of an old hospital and remains of a terraced pond are what is unearthed at this 180 BC Buddhist monastery at the foothill of 600m high Ritigala Rock. Dating back to around 350 B.C, it is one of the oldest historical places mentioned in the ancient chronicles situated about 50 km south east of Anuradhapura.

Anuradhapura preservation area

102. In the late 1990's it was felt that the issues related to urban development exerted undue pressure on Anuradhapura. The lack of development of other urban centres of the region meant that employment opportunities were available mostly in Anuradhapura only. The sacred area also offered much in the way of employment in the UNESCO-sponsored Cultural Triangle projects and other informal employment in the sacred area. Accordingly, the Greater Anuradhapura Development Scheme that was prepared at the turn of this century took into consideration a large area covering almost 5% of the area of Sri Lanka. Intensive concentration on urban development was ironically considered as a strategy to save Anuradhapura and

Mihintale from cracking down under pressure. The planning concept applied was in fact an extension of that used centuries ago. A third ring was added to the two concentric rings of ancient Anuradhapura. Whereas the first ring surrounding the ancient city was the monastic ring, and the second ring the forest monastic ring the third ring of the modern times was an agro-based industrial ring.

103. Mihintale is one of the key religious sites and is regarded as the birthplace of Buddhism in Sri Lanka. It is located about 10 miles east of Anuradhapura along Anuradhapura – Trincomale major road and it is also at the junction of Kandy – Jaffna road. Mihintale was originally known as Missaka Pakbata and Sila Kuta (peak). In the northern peak of this mountain, the Tera Mahinda after arrival to the island of Sri Lanka and below Sila Kuta is the vast table land Ambathala and the whole of this area is included in the cultural triangle.

104. In 247 B.C. Buddhism was first introduced to Sri Lanka on the mountain of Mihintale. Since then, various kings of Sri Lanka have blessed this rock with magnificent masterpieces of architecture. These include a hospital, a monastic complex, stupas and dagobas. While some of these structures are in an almost perfect state of preservation, others are in complete ruin. The most spectacular of these is the Kantaka Chaitiya, which displays some of the finest architecture of the early Anuradhapura era.

4.2 Kandy District

No.	List of Subprojects in the Area
D-3	Ethgala Gantry to Storefield Gantry
D-4	Gantry at Ethgala

4.2.1 Physical Resources

4.2.1.1 Topology, Geology and Soil

105. Kandy district forms a substantial and integral part of the Central highlands, straddling the South-western, Northern and North-eastern parts of the mountain complex (See **Figure 15**). The major part of the land surface has an elevation range of 300 - 1,000 m and therefore much of the district falls in the category called mid-country, whereas only small parts falling in the other two elevation categories namely low and up country. Consequently, Kandy district has a dissected and intricate pattern of ridges and valleys and much of the land is sloping but with a fair proportion in valleys of varying shape, width and extent. Larger valleys are in extreme North-East and in the East of varying shapes, width and extent. There are three types of soils available in Kandy district - Red Yellow Podsols, Low Humic Glay and Reddish Brown Lassoic soils. Dolomite depositions are also available in Kandy district. Composition of the soil is a grey brown to yellowish brown top soil and mostly a yellowish Red sub soil. The top soil is sandy loam, sandy clay loam, or loam while the subsoil is sandy clay loam or clay.



Figure 15: District map of Kandy

4.2.1.2 *Climate*

106. Annual average rainfall of the Kandy district is above 1,760 mm. In most parts of the district, three rainy months are October, November and December except the Southern part of the district where May, June and July are the rainy months. In Eastern parts of the district, highly wet months are December, January and February. In general, dry months are January, February and March. Consequent to the abundant and uniform distribution of sunlight, there is a fairly uniform seasonal temperature in the district. Temperature largely depends on the altitude. The difference between the lowest and the highest point in the Kandy district is 11 °C. Daily temperature variation is greater during the cool months of the year and particularly when the air is dry and sky is clear. The relative humidity of the district is 63% to 83% in day time and in night it varies between 88% and 97%.

4.2.1.3 Water Resources

107. About 90% of Kandy district falls in the basin of the Mahaweli Ganga, which flows through the Central part of the district slightly beyond Kandy, then, turns South –Eastward for about 40 km and then Eastward for another 50 km to Minipe forming the Southern boundary of the district and finally, it then flows northwards for about 60 km forming the Eastern boundary, Mahawlei Ganga and its watershed is the most important physical feature in the district. There are number of tributary streams contributing to the Mahaweli which entirely lie within the district. The important tributary streams are Atabage Oya, Nilambe Oya, Nanu Oya, Pinga-Oya, Kota-Ganga, Hulu-Ganga and Maha Oya. River Mahaweli has dams at Polgolla and Teldeniya. Former being storage for Ukuwela hydropower plant and serves as the starting point of the Mahaweli irrigation for the North-Central province. Springs are very common in high elevation of

curving ridges of the arenas. Most of the high ridges are crowned by protected forests which contribute immensely to the pereniality of these springs. In some villages in Kandy, springs are used as the source for village water supply schemes. The Mahaweli development project is a multi-purpose river valley which leads to energy production, storage reservoirs, canals, irrigation schemes and settlement/resettlement programmes within the district.

4.2.2 Ecological Resources

There are 21 waterfalls located in district of Kandy. Ahupini Ella is one out of that located 108. in Kandy district and the height covers 30 m. Surrounding area is rich with fauna and flora adapted to moist environment conditions. Adams Peak Falls 10 m high fall flows from the aquifers of Sri Pada and later on to Maskeli Oya Reservoir. Huluganga Falls (75 m in height) is one of many created by the streams originating from the Knuckles mountain range. The cascading water sprinkles the villages of Elliyadda and Aratthana, before flowing to the Victoria Reservoir. It is popular with both local and foreign visitors and villagers regard it as part of their Dumbara heritage. The fall is situated below the Town of Hulu River, near Panwilla, (Kandy District, and Panwilla Provincial Secretariat Division) Ratna (Navarathna) fall. The 101 m fall is the highest in the Kandy region and the stream that serves it irrigates the paddy fields of the surrounding villages. The route to the falls winds through villages between the Hunasgiriya mountain range and dense jungle. From Hasalaka, travel on the Kandy-Mahiyangana highway towards Wasgamuwa National Park to the Eke Ela Agri-Colony. Balakaduwa Falls, Dehigolla Falls, Divakerella Falls, Hunnas Falls and Upper Hunnas Falls are some other nature's creations in Kandy district.

4.2.3 Economic Development

4.2.3.1 Land Use and Agriculture

109. The district of Kandy is situated south of the Island, surrounded by five districts- Matale to the North, Nuwara Eliva to South, Badulla to the East, Kegalle to the West and Kurunegala to the North-west. The extent of the district is about 1,905 km² which is about 3% of the Island. Kandy district has a total land area of 3,275 km² including 39 inland water bodies. Pattern of human settlements around the roads vary from rural to semi-urban. Rural environment is mainly consisting of residential places, home gardens and agricultural lands. The most important plantation crop in the district at present is tea, but its extent is declining rapidly. Rubber accounts for only less than 2%. Among the non-plantation crops, paddy occupies a dominant position. Nearly 20% of the district is covered with home gardens. There is a considerable variation in the extent of home gardens in the district. Some DS divisions have over 50% of land under cropping system and hardly any home garden. In some DS divisions, home gardens are distributed in small plots in close association. The total extent of tea in the district is 15% and it is rapidly declining. The tea plantation in Kandy belongs to mid country. Most of the communal forests and crown forests that existed in the pre-colonial period have been converted to tea plantations. The district forest cover has been reduced to a level that is substantially below the national average.

110. The plantations around Kandy, the ancient capital of Ceylon (Sri Lanka), supply what are known as mid country teas. These are notable for full bodied strong tea, which appeal to everyone who likes a good thick colour brew. The tea plantations are located from 600 to 1,200 m and are the region where tea was first grown in Sri Lanka. A range of hills extends to Nilambe, Kotmale and Gampola areas. The valley is protected from strong monsoon rains and the teas are darker and stronger. Those plantations in Hewaheta, which experience weather

changes associated with the South-West Monsoon winds, acquire a flavour character during the eastern monsoon season. According to 2002 census data, 21,975 ha of tea, 1,163 ha of rubber and 7,888 ha of coconut were cultivated within the district of Kandy.

4.2.4 Social and Cultural Development

4.2.4.1 *Population and Community*

111. A total of 20 DS divisions are located within the Kandy district representing all ethnic and the religious group in the country. From the total population distributed in the district, 74.1% Sinhalese, 4.1% Sri Lankan Tamil, 8.1% Indian Tamil, 13.1% Sri Lankan Moor, 0.2% Burgher, 0.2% Malay and 0.2% others. Mainly four religious groups are represented in the district as follow: 82.9% Buddhist, 3.3% Hindus, 9.9% Muslims and 0.5% Catholics.

4.2.4.2 Health and Educational Facilities

112. A total of 78 hospitals are distributed in different locations of district. These include 3 Teaching hospitals, one District general hospital, 2 Base hospitals Type B, 11 District hospitals, 9 Peripheral units, 26 rural hospitals, one prison hospital, 24 Central dispensaries and a single Central dispensary and Maternity home. Out of these hospitals, 3 teaching hospitals are located at Kandy and Peradeniya (2 hospitals), a single District general hospital locates at Nawalapitiya, 2 base hospitals are located in Gampola and Teldeniya.

113. Within the district, altogether 721 schools including 645 government schools, 5 private fee levying schools, 1 private non fee levying school, and 69 Pirivenas are distributed. Generally, the education level of the district is significantly high. The literacy rate of the district is 91.8%.

4.2.4.3 Sites of the Cultural, Archeological and historical Significance

114. Kandy, the last royal capital of Sri Lanka is a major tourist destination. Famous for the Temple of the Tooth and many other temples in the city, Kandy could be called the cultural capital of the Island. Kandy is surrounded with many major Buddhist temples. On the shores of the lake are Malwaththa and Asgiri temples. Fine painted murals of Buddhist stories in these temple buildings are a good example of the arts in the Kandy period while paintings of the Hindagala temple at Peradeniya are of the 7th century. Lankatilaka temple is a magnificent building built on rock at a scenic location which also has fine paintings. Gadaladeni Viharaya was made 14th century temple is situated about 15 km from the town. The structure of the temple is influenced by the South Indian architecture and built on a rock. The stupa is on a high stone platform. Embekke Temple is main attraction is the intricate wooden carvings of this 14th century shrine dedicated to God Kataragama. There is also a Buddhist temple on location. Entire structures of some wooden buildings are decorated with dancers, musicians, wrestlers, legendary beasts and birds. Nearby are the ruins of an ancient rest house with similar pillars carved in stone.

4.3 Trincomalee District

No.	List of Subprojects in the Area
D-5	Kappalthurai GSS to Chinabay Gantry.
D-6	Gantry at Chinabay

4.3.1 Physical Resources

4.3.1.1 Topography, Geology and Soil

Geography

115. Trincomalee District is located in the east of Sri Lanka in the Eastern Province (**Figure 16**). Located on the east coast of the island overlooking the Trincomalee Harbour, 113 miles south of Jaffna and 69 miles north of Batticaloa, Trincomalee has been one of the main centres of Tamil language speaking culture on the island for over two millennia.

116. It has an area of 2,727 km². Trincomalee district has 11 DS Divisions, 230 Grama Niladhari Divisions, 621 Villages having a population of 414,320 with a total number of families: 106,437. Trincomalee District, which is in the Northern part of the Eastern Province, is bounded in the North by Yan Oya, by Anuradhapura and Polonnaruwa Districts in the West and by Verugal Ganga in the South.



Figure 16: Trincomalee District map

Geology and Soil

117. Mainly 5 major soil groups found in Trincomalee District as Alluvial soils 35 %, Reddish Brown Earth 30%, Sandy Regosols 10 %, Erosion remnants 10 %, non-classic brown alkaline saline and soil with gravel 15%. Considering the geomorphology in Trincomalee district, 5 main types are classified as; Hills and cliffs, Dunes, Estuaries, lagoons and Thona, Beach bars and spits and Beaches/shorelines.

Soil

118. The topography of the area is flat, with undulating hills reaching 100 m above mean sea level. The coastal zone of the area consists of rock cliffs made up of metamorphosed sediments of rocks from the Pre-Cambrian age belonging to the Highland Series. The Highland series consist of quartzites, Schists and Crystalline limestones.

Climate

119. Trincomalee features a tropical wet and dry climate (AS) under the Köppen climate classification. The city features a dry season from March through June and a wet season for the remainder of the year. The city sees on average roughly 1,570 millimetres (62 in) of precipitation annually. Average temperatures in Trincomalee range from around 26 degrees C (79 F) in December and January to approximately 30°C (86 F) during the warmest months of the year from April through September. Reliably recorded temperatures in the city range from 19.9°C (67.8 F) to 39.5°C (103.1 F).

Rainfall

120. The area receives an annual rainfall of approximately 1,700 mm, and has an average annual temperature of approximately 27°C. The climatic conditions of the area are influenced primarily by the inter-monsoonal rains in March and April, and an extensive dry period extending from May to September. The long dry spell is followed by a rainy season influenced by the northeast monsoon, between November and January. It features dry season from February to July and wet season for the remainder of the year. Trincomalee district receives rain during two short seasons. Usually northeast monsoon brings about 50% of the total rainfall and southwest monsoon only brings about 10% of the total rainfall. The principle causes for the low rainfall rate in the District can be given as, extensive plain morphology and the absence of a mountainous area within the District to intercept the northeast monsoon.

4.3.2 Economic Development

121. According to the statistics, the total population of the Trincomalee District is 378,182. This population comprises 101,742 families scattered in 230 GN Divisions of 11 DS Divisions. Out of this more than 54,000 families (more than 50%) depend on farming and another 10,000 families (10%) are engaged in fishing. This suggests that agriculture and fishing are the major economic activities in Trincomalee District. Main agricultural crops of Trincomalee district are paddy, vegetables, fruit crops and maize, red onion, ground nut and chilly. Trincomalee District has 70.2 km length of railway track and 8 stations. Train takes 8 hours to reach Colombo from Trincomalee. Trincomalee commands a large natural and a wide body of sheltered waters. Trincomalee harbor, under the administrative control of Sri Lanka Ports Authority (SLPA) is considered to be a one of the world's best harbors. The national grid provides power to Trincomalee District and approximately 40 % is from renewable hydroelectric power.

4.3.2.1 Minerals

122. The sand found in the coastal area of district is very important due to its high Ilmenite mineral content, which is found in very few other places around the world. Ilmenite contains titanium oxide. Titanium is an important component of light metal alloys used in the aircraft and space manufacturing industries. Pulmoddai heavy mineral beach sand deposits (monazite,

zircon) extend from the north of the District. The deposits consist largely of Ilmenite but also contain appreciable amounts of monazite, zircon and baddeleyite – a unique deposit by itself and exploited by the Ceylon Mineral Sands Corporation. The rocks at Kuchchaveli exhibit magnetic polarity due to the alignment of magnetite in the rock. Further south, charnockite at Tavikallu and quartz reefs at Mankanai also can be stated.

4.3.2.2 Infrastructure

123. Trincomalee port has a deep draft capable of handling the largest ships as well as availability of adjacent land for development. It is located at the east coast of Sri Lanka and could become the hub port for East India, Bangladesh and Myanmar.

4.3.3 Ecological resources

124. The Forest Area according to Conservation Status (Forest Department) in Trincomalee is 145,376 ha (**Table 12**). This total forest area includes Brackish and saltwater forests, dry monsoon forest , fresh water forest, mangroves, moist Monsoon forest, woodland, dry forest, riverine dry forest and sparse. Dry monsoon forest is the most common forest type in Trincomalee district and it occupies total area of 1087.1 km². Main service of this forest type is that it serves as habitat for wildlife. Sparse forests are the second most common type in Trincomalee district and total area of that is given as 144.46 km². Thirdly, most common type is forest plantations; it has total area of 67.86 km². Some forest areas are degraded due to the chena cultivation and these are at different stages of regeneration.

125. As a district located in the dry zone of the island, Trincomalee is home to a faunal composition representing the dry zone fauna of Sri Lanka. Most of the species of fauna common in this zone can be found in Trincomalee district too. This includes animals ranging from small insects to larger mammals such as the Asian Elephant. Protected area network within the district provides suitable habitats for these animals. The coastal habitats, shallow seas and the islands in the area are also highly ecologically important due to the presence of coral reefs and other shallow sea fauna including the rare and relict species like Lingula.

126. The oceans adjoining the district are very popular destinations for whales, dolphins and sea bird watching. Trincomalee district is known to support the existence of 38 nationally threatened vertebrates as of 2012. These vertebrates includes 2 freshwater fish species, 2 amphibian species, 2 reptile species, 26 bird species and 6 mammal species. However, the faunal composition of these areas is largely under studied. Several species of reptiles and dragonflies which have been recorded from Trincomalee district in the past. The dragonfly Hemianax ephippiger, the snake Dendrelaphis oliveri (Oliver's bronze back) and the two skinks Nessia deraniyagalai (Deraniyagala's snakeskink) and Lygosoma singha (Taylor's skink) are such species.

Name	Category	Extent (ha)
Chundankadu	FR	5690.3
Chundankadu	PR	8443.7
Great Sober Island	S	64.5
Kantalai	FR	37479.3
Little Sober Island	S	6.5
Mahaweli Ganga	PR	6475.0

Table 12: Name, category and the extent of Forest Reserves in Trincomalee district

Name	Category	Extent (ha)
Mahaweli Ganga North and South	FR	8642.1
Pankulam-Northern Block	PR	52355.9
Pigeon Island	S	4.7
Seruwila-Allai	S	15540.0
Trinconmalee Naval Headworks	S	18130.3
Vappiah-Verugal	FR	4344.7
Kinniya	PR	14.2

FR- Forest Reserve, PR- Proposed forest Reserve, S- Sanctuary

Rivers and streams

127. Trincomalee District receives much of its water from the central highlands and particularly during the dry season, water may become limited. The water is found as surface water and groundwater. Much of the District is covered by the Mahaweli river basin, the Yan Oya, Kunchikulan Aru, Pankulam Aru, Pan Oya and Kantale Oya.

4.3.4 Social and Cultural Development

4.3.4.1 Population

128. The population of the Trincomalee district by 2012 amounted to 378,182. The population density of Trincomalee district is 140/km². The male population representing 49.54% amounts to 187,357 persons. The female population accounts for 190.825. On a community basis, Sinhalese accounts for 101,991 persons. This is 26.96% of the total population of the district. Muslims accounts for 152,854 persons and Tamils accounts for 122,080 persons. In categorizing the population on the basis of religions, 98,772 persons are Buddhists, 159,251 belong to Islam and Hindus and Christians account for 98,133 and 21,892 respectively.

4.3.4.2 Road and rail

129. Trincomalee is on the eastern end of the A6 and A12 highways in Sri Lanka, as well as the northern end of the A15. The city is also served by Sri Lanka Railways. Trincomalee Railway Station is the terminus of Trincomalee-bound rail services, the majority of which originate from Colombo Fort. The station lies close to the northern coast and beaches of the city.

4.3.4.3 Health Facilities

Health Facilities

130. Only the urban DS Divisions have medical facilities and rural communities are relatively poorly served. Health facilities includes one general hospital; Trincomalee, two district hospitals; Kinniya and Muttur, one base hospital; Kantale, three rural hospitals; Gomarankadawala, Serunuwara and Nelaveli. Most abundant facility is central dispensaries, situated in different locations of the district.

4.3.4.4 Educational Facilities

131. Government maintains a network of primary and secondary schools in Trincomalee District. Within the district, altogether 269 schools are established, including 11 schools up to

secondary education to G.C.E (A/L) Science, 54 schools up to secondary education to G.C.E (A/L) Arts & Commerce, 90 schools up to Secondary Education and 114 schools up to primary education.

132. The Naval and Maritime Academy of the Sri Lanka Navy and the Air Force Academy of the Sri Lanka Air Force is situated in Trincomalee. It was first established in 1967, and gained university status in 2001. The Eastern University of Sri Lanka, which has its main campus in Batticaloa also has a campus in Trincomalee.

133. There are other colleges such as T/R.K.M.Sri Koneswara Hindu College, Zahira College, Trincomalee, St Joseph Collage, Trincomalee, T/Sri Shanmuga Hindu Ladies College, T/St Mary's College, Orr's Hill Vivekananda College, T/Vikneswara Mahavidyalayam, Sinhala central college at Trincomale town, Naamahal Vidyalayam, Trincomalee, Kalaimahal Vidyalayam, Trincomalee, St Francis Xavier School, T/Nalanda College, China Bay, T/Siraj Muslim maha vidyalayam, T/vipulananda college, Jesuit Academy of Trincomalee.

4.3.4.5 Archaeological, Cultural and Historical significant sites:

134. The district was captured by Portuguese in the 16th century. The destruction and looting of the Koneswaram Temple by Constantine De Susa on a New Year day in the beginning of 1620 was a turning point in the history of the District. The Dutch conquered this district from Portuguese in 1693 and it fell into the hands of British in 1796.

135. There are several Hindu historical sites in Trincomalee district. The Koneshvaram temple attracted pilgrims from all parts of India. This Hindu temple was also documented in several late medieval texts such as the Konesar Kalvettu and the Dakshina Kailasa Puranam.

The Hot Springs - Among the sights of the place are the seven hot springs of 136. Kanniyayi, on the road to Trincomalee. The water is mildly hot; the temperature varies. In effect, a public bathing resort, the use of the springs is controlled by the neighbouring Mari Amman Kovil who holds the lease of the wells. The site of the springs is crown land. The Dutch Fort -Fort Fredrick was built in 1623 by the Portuguese and captured in 1639 by the Dutch. It then went through a phase of dismantling and reconstruction and was attacked and captured by the French in 1672. Hindu historical sites - The Konesvaram temple attracted pilgrims from all parts of India. The Konesvaram shrine itself was demolished in 1622 by the Portuguese (who called it the Temple of a Thousand Columns), and who fortified the heights with the materials derived from its destruction. Some of the artefacts from the demolished temple were kept in the Lisbon Museum including the stone inscription by Kulakottan (Kunakottan) It has an emblem including two fish and is engraved with a prophesy stating that, after the 16th century, westerners with different eye colours will rule the country for 500 years and, at the end of it, rule will revert back to Vadugus. The Hindu temple was also documented in several late medieval texts such as the Konesar Kalvettu and the Dakshina Kailasa Puranam.

4.4 Colombo District

No.	List of Subprojects in the Area
D-7	Augmentation of Ethulkotte PSS
D-10	New PSS at Rattanapitiya

4.4.1 Physical Resources

4.4.1.1 Topography, Geology and Soil

137. Colombo is the most highly populated district in Sri Lanka. According to the census reports in 2012 the population was 2,309,809. Colombo district is divided into 13 Divisional Secretariat Divisions and their activities are coordinated and supervised by the Colombo District Secretariat. Colombo district is a combined mixture of mountains, plains and marshlands. North and east parts of the district are mountainous whereas east and southeast parts are surrounded by marsh lands. City of Colombo is connected by a network of canals and at the heart of the city is the Beira Lake (**Figure 17**). The boundaries of the Colombo district are North-Kelani River (Gampaha district), South-Bolgoda River (Kalutara district), West-Coast line, and East-Sabaragamuwa Province.



Figure 17: Map of Colombo District

Geology

138. Vast area (over 90%) of Sri Lanka is underlain by metamorphic crystalline rocks of Precambrian age, which includes the Colombo area, which cover a variety of Gneisses. The geology of Colombo is representative of the geology of the western coast of Sri Lanka and has existed for much of the Quaternary era. This is shown in the 1:10,000 and 1:50,000 geological maps of Colombo region produced by the Geological Survey and Mines Bureau (GSMB). The

typical rock types of this basement include Biotite gneiss, Hornblende Biotite gneiss, Charnockites, Charnockitic gneisses, Quartzite and undifferentiated Meta sediments. The floodplains along Kelani River and the Kalu Ganga rivers consist mainly of alluvial deposits. The floodplains of Kelani River also provide thick alluvial profiles for unconfined aquifers, in addition to the productive overburden along tributary banks.

139. Bore holes drilled in central Colombo City show that this area once formed an estuary of the Kelani River and the Kalu Ganga River, the two main rivers that drain into the sea on the western coast. A few kilometers upstream in the inland valleys, there is a high-level gravel formation consisting of quartz pebbles embedded in a matrix of laterite separated with pebble-free layers of laterites. The floodplains along the rivers consist mainly of alluvial deposits. The floodplains of Kelani River also provide thick alluvial profiles for unconfined aquifers, in addition to the productive overburden along tributary banks.

140. According to Survey Department soil maps the main soil types and terrain in the project area are Red Yellow Podzolic soils with soft or hard laterite: undulating terrain, Bog and Half bog soils: flat terrain, Alluvial soils of variable texture and drainage: flat terrain and Regosols on recent beach sands: flat terrain.

4.4.1.2 Geography and climate

141. Colombo's geography is a mix of land and water. The city has many canals and, in the heart of the city, there is a 65-hectare Beira Lake. The northern and northeastern border of the city of Colombo is formed by the Kelani River, which meets the sea in a part of the city known as the Modera (mōdara in Sinhala) which means river delta. Colombo's climate is fairly temperate all throughout the year. From March to April the temperature averages around 31°C. The only major change in the Colombo weather occurs during the monsoon seasons from May to August and October to January. Colombo sees little relative diurnal range of temperature, although this is more marked in the drier winter months, where minimum temperatures average 22°C. Rainfall in the city averages around 2,400 mm a year.

4.4.2 Economic Development

142. The majority of Sri Lankan corporations have their head offices in Colombo. Some of the industries include chemicals, textiles, glass, cement, leather goods, furniture, and jewellery. In the city centre is located South Asia's second tallest building – The World Trade Centre. The 40-story Twin Tower complex is the centre of important commercial establishments, situated in the Fort district, the city's nerve centre. Right outside the Fort area is Pettah which is derived from the Sinhalese word pita, which means out or outside as it is outside the Fort.

143. Pettah is more crowded than the fort area. Pettah's roads are always packed and pavements are full of small stalls selling products ranging from delicious sherbat to shirts. Main Street consists mostly of clothes shops and the cross roads, which are literally known as Cross Streets where each of the five streets specializes in a specific business - First Cross Street is mostly for electronic goods shops; the Second cross street is mostly for cellular phones and fancy goods. At the end of the main street further away from Fort is the Sea Street, Sri Lanka's gold market. This mile-long street is full of jewellery shops. The Colombo Metropolitan Region (CMR) encompasses the country's administrative capital Kotte and Colombo. Found within the borders of the CMR is 80% of the country's industries and over 60% of all vehicles plying Sri Lankan roads. The per capita income of the Western Province stood at USD 3,808, making it one of the most prosperous regions in South Asia.

144. Colombo district has relatively high proportion of modern facilities such as teaching, provincial, and base hospitals while in Gampaha and Kalutara Districts these facilities are very limited. For example, there are 610 hospital beds per every 100,000 population in Colombo district, compared with 260 beds in Gampaha and 210 in Kalutara. In terms of doctors per 100,000 populations, Colombo district average is 68 while the average for Gampaha and Kalutara are 17 and 22 respectively.

4.4.3 Ecological resources

145. The forest cover in Colombo district is 1,832 ha (2.7%). This forest area includes mainly the lowland rain forest formation. In addition, several wetlands are found e.g. Muthurajawela, Bellanwila-Attidiya, and Sri J'Pura Bird Sanctuary (**Table 13**).

Name	Category	Extent (ha)
Bellanwila-Attidiya	S	60.0
Getamarawa-Dunkolahena	PR	129.7
Indikada Mukalana	PR	747.5
Kananpella	FR	263.5
Miriyagalla	FR	123.1
Sri Jayawardenapura Bird	S	449.2
Muthurajawella	S	0.0
Labugama-Kalatuwawa		
(Col/Kal/Rat districts)	FR	2150.1

Table 13. Name, category and extent of forests areas in Colombo district.

S- Sanctuary, FR- Forest Reserve, PR- Proposed Forest Reserve

3.5.3 Biodiversity

As the district with highest urbanization and population density Colombo has very little 146. natural habitats left. Still, the remaining habitats harbour a considerable faunal diversity within them. The wetland areas such as Bellanwila-Attidiya Sanctuary, Thalangama Environmental Protection Area, Jayawardenapura marshes, Bolgoda wetlands support the existence of many species of fauna that associates wetlands. According to a recent study conducted, the Bellanwila-Attidya Sanctuary and the vicinity areas provides habitat for many animal species including 75 butterflies, 22 fish, 11 amphibians, 27 reptiles, 78 birds and 14 mammals. The mammals which have been recorded even include threatened species such as the Fishing Cat. Many migrant birds also visit the wetlands in the Colombo district including uncommon migrants like the Glossy Ibis which is a regular visitor to both Bellanwila-Attidiya and Thalangama area. The few remaining forest patches, especially associated to the Buddhist monasteries and the sub-urban home gardens are also important in sustaining the fauna in the district. Apart from the large vertebrates, Colombo district is also important in invertebrate diversity. Few nationally critically endangered dragonflies such as Agriocnemis femina, Cyclogomphus gynostylus has been recorded from the wetlands in the district, and a small marsh close to Hanwella city in Colombo district is the only known locality of the recently recorded Archibasis oscillans hanwellanensis. However due to the rapid on going urbanization many of the faunal species recorded from the district are under threat. The National Redlist 2012 of Sri Lanka states that 20 species of freshwater fish, 13 species of amphibians, 5 species of reptiles, 13 species of birds and 7 species of mammals recorded from the district are under the threat of extinction at the national level.

4.4.4 Social and cultural Profile

147. The Colombo Metropolitan Region, defined by the districts of Colombo, Gampaha and Kalutara, has an estimated population of 5,648,000, and covers an area of 3,694.20 km². As per the Provincial Gross Domestic Product-2010, the Western Province, which includes the cities of Colombo, Gampaha and Kalutara recorded GDP per capita of USD 3,808, the highest recorded GDP per capita for any region in South Asia. Colombo has the highest degree of infrastructure - electricity, water and transport etc. The majority of the major shopping malls in Sri Lanka are located in the city apart from that, many luxurious hotels, clubs and restaurants are situated in the city. In recent times, there has been an outpour of high-rise condominiums in the city, mainly due to very high land prices.

4.4.4.1 Population

148. Colombo district's population was 2,309,809 in 2012 according to the census of population and housing. The ethnic composition is 76.6% Sinhalese, 12.2% Tamil, 9% Muslim and 3% others. The literacy rate of the population aged 10 years and over is 93.6% (male 94%, female 93.1%). The labour force participation rate, expressed as the percentage of employed aged 10 years and over, is 47.5%. Employment rate is 93.6% and unemployment rate is 6.4%. The people tend to be engaged in craft and craft related work, manufacturing and wholesale and retail trade. The total number of households in the district is 555,926, 86.8% are permanent houses, 11.2% are semi-permanent houses, 0.3% are improvised houses and 1.8% are not classified. Out of the occupied housing units, 71.6% are single houses, 9.2% are flats, 6.4% are row houses/line rooms, and 1.5% is huts.

4.4.4.2 Sites of Cultural, Archaeological and Historical Significance

149. Colombo District was part of the pre-colonial Kingdom of Kotte. The district then came under Portuguese, Dutch and British control. In 1815 the British gained control of the entire island of Ceylon. They divided the island into three ethnic based administrative structures: Low Country Sinhalese, Kandyan Sinhalese and Tamil. Colombo District was part of the Low Country Sinhalese administration. In 1833, in accordance with the recommendations of the Colebrooke-Cameron Commission, the ethnic based administrative structures were unified into a single administration divided into five geographic provinces. Colombo District, together with Kalutara, Puttalam, Seven Korales (present day Kurunegala District), Three Korales, Four Korales and Lower Bulatgama (present-day Kegalle District) formed the new Western Province. At the time that Ceylon gained independence, Colombo was one of the two districts located in the Western Province. Parts of the district were transferred to newly created Gampaha District in September 1978.

4.5 Ratnapura District

No.	List of Subprojects in the Area
D-8	Embilipitiya GSS to Weniwelara

150. **Figure 18** shows Ratnapura District.

4.5.1 Physical Resources

4.5.1.1 Topography, Geology and Soil

151. Ratnapura district is located to the Southwest and South of the Central Highlands and lies between 6°15' - 6°55 latitude and 80°10'-80°57' longitude. The general elevation of the district ranges from 30 m to 2,135 m mountain ranges, high peaks; dissected plateaus cover a greater part of the district. From its height and slopes characteristics, the district can be divided into three main morphological regions lowlands, uplands and highlands. The lowlands include mainly basins of Kalu and Walawe rivers. The uplands with an elevation of 270 m to 1,060 m consist of a ridge and valley topography. Furthermore, the uplands are also characterised by highly dissected plateaus of the Sabaragamuwa ridges, the Rakwana hills and the Southern platform of the Central Highlands. The highlands which lie at the elevation of over 1,060 m consists of plains and plateaus, mountain peaks and ridges, rock –knob plains, erosional remnants, steep rocks lands and lithosols.



Figure 18: Map of Ratnapura District

152. Geologically, Ratnapura district is made up of the Highland series of rocks belonging to the Precambrian age. Approximately two-third of the area is made up of undifferentiated rocks of the Highland Series. These rocks are widely distributed in the area of the Southern Platform and the Rakwana massif. The charnockites and the charnokitic geneisses extend along the Southern rim of the Central Highlands and have been concentrated in the Northwest of the district. In addition, patches of marble (common dolomite, calc-granulite or gneiss) can be seen in Pelmadulla-Godakawela area in the area lying between Weragoda and Gongala, as well as between Colombage Ara.

153. Distribution of soils in the Ratnapura district has close affinity with topography, geology and climate. The highest elevation of the Southern rim of the Central Highlands, Rakwana massif and Southern platform are formed by erosional remnants. Other major soil types found in the district are Red-Yellow Podzolic soils, Reddish Brown Earths and Low Humic Gley soils, Reddish Brown Earths and Alluvial Soils.

4.5.1.2 Climate

154. Ratnapura district falls mainly in the wet zone of Sri Lanka. The district receives rainfall mainly from Southwestern monsoons from May to September. During the remaining months of the year, there is considerable precipitation due to convective rains. The average annual precipitation is about 4,000 to 5,000 mm. Temperature is manifested fairly uniformly in the low land stations in Sri Lanka and varies between 27.5°C and 30°C. However, the temperature rapidly decreases with vertical ascent in the Highlands. Relative humidity varies generally from about 75 and 80% percent during the day to about 90 to 95% at night. The regimes of relative humidity and rainfall coincide: high rainfall is connected with high humidity and low rainfall with low humidity.

4.5.1.3 Water Resources (Ground Water and Surface)

155. Surface water resources in the project area consist of rivers that originate from the central highland area, and inland lakes and reservoirs of natural and artificial water, which are used for the purpose for water storage, irrigation, and drinking water supply. Several waterfalls include Bopath Ella Falls, Handapana Falls, Ettamala Falls, Haathmale Falls, Galdola Falls and Krinda Ella Falls. These waterfalls are rich in beauty. Ratnapura district is located at Western River basin of Sri Lanka. Two major tanks Chandrika wewa and part of the Udawalawe reservoir are also located within the Western River basin of the district. The central part of the Ratnapura district is highly dissected by the tributaries of the Kalu Ganga and the Walawe Ganga. The Kalu Ganga is the second largest river in Sri Lanka with a mean flow of 280 m³/s. Its basin has an area of 2,720 km. The Walawe Ganga lies to the east of the Kalu Ganga basin and is separated from it by a range of hills rising up to 1,000 m in height. The river flows across undulating terrain and drops gently from the foot of the Central Highlands to follow its Southwesterly course.

4.5.1.4 *Air Quality and Noise*

156. Areas where road traffic is concentrated, or where certain air polluting industries are situated can result in a significant decline in air quality. In most of the areas of this region, the Ambient Air Quality measurements are within the limits of National Ambient Air Quality Standards. Even though the air pollution is well within the National Ambient Air Quality Standards, diurnal pattern of ambient air quality parameters such as CO, SO₂ and NO₂ indicates that mobile sources have made major contributions to air pollution in these locations. Noise levels attributable to traffic and industrial activities are lower in teas estates areas, which are mostly rural areas.

4.5.2 Ecological Resources

157. Two main vegetation types occur in Ratnapura district-tropical rain forest and the mountain forest. The Sinharaja forest also belongs to this type. There are also small reservations at Waratelgoda, Delgoda, Delwala, Kuduminiya, Damalakanda and Welankanda, which show characteristics somewhat similar to Sinharaja. Towards the Southern part of the district, the deciduous trees populate the evergreens. Owing to chena cultivation and heavy logging operations, the dense forest cover in the district has been reduced by as much as 9% percent in recent years.

158. Singharaja Forest Reserve is the most famous rainforest of the country. This tropical rain forest is a living heritage. Biodiversity of the forest is very high and a large proportion of the flora

in this forest is endemic to the country and some endemic to the Singharaja Forest itself. Of Sri Lanka's 830 endemic species, 217 trees and woody climbers are found in the lowland wet zone. Of these, 139 (64%) have been recorded in Sinharaja, 16 of which are considered to be rare. Peak Wilderness Sanctuary lies in the centre of the western ridges of the Central Highlands, Northeast of Ratnapura, and straddles the border between Central and Sabaragamuwa provinces. It is an important watershed for three major river systems: Kelani, Walawe and Kalu rivers. Peak Wilderness is one of the few remaining areas in Sri Lanka with continuous tracts of attitudinally graded forest, raining from lowland rain forest to high altitude cloud forest. Lowland forest is restricted to a few small areas on the lower slopes of the Peak Wilderness Range. The Udawalawe National Park is situated in the dry zone of the country belonging to Sabaragamuwa and Uva provinces. The park lies within dry zone and small segment lies within intermediate zone. Park consists of dry lowland forest, riverine forest, thorny scrublands and grasslands. Udawalawe National Park is world famous for its large elephant populations. In this park, one can observe elephants at any given time of the day. Other than elephants, water buffalo, spotted and barking deer, wild boar, sambhur, jackal and ruddy, grev and striped necked mongoose are also found in this park. Though the leopard, jungle and fishing cats have been recorded in the park, their sightings are very rare. The park is also famous for birdlife. Crested serpent eagle, changeable hawk eagle, white-bellied sea eagle and grey-headed fishing eagle are the main raptors found in the park. Painted stork, open bill, little and Indian cormorant, Indian darter, many species of waders are also found within the park. Among the forest birds, are the warblers, Sri Lanka Jungle fowl, Malabar pied hornbill, Sikir Malkoha, Blue face Malkoha, common Caucal, and grey hornbill.

4.5.3 Economic Development

4.5.3.1 Land use and Agriculture

Ratnapura district has a total land area of 3,275 km² including 39 inland water bodies. 159. Ratnapura has a population of 1,088,007 (336 persons per km² (2012 data)). In the rest of the district, the pattern of population and settlements distribution closely follows the relief. Thus, there is a high concentration of population in a zone stretching from Eheliyegoda through Kuruwita, Ratnapura, Pelmadulla, Godakawela, Kahawatta to Embilipitiva, Agriculture crops in the Ratnapura district consist of perennial and semi-perennial crops, which mostly include cash crops, paddy and other crops (Tea, rubber, coco, cardamom). In 2002, nearly 38,759 hectares of land area was under tea cultivation. It is nearly 13% of the total area under tea in Sri Lanka. Ratnapura district is the third largest rubber growing area in the island with an extent of 21,669 hectares being utilised for the crop. This is about nearly 18% of the total area under rubber in the island. Almost 3% of the coconut cultivation in the island is found in the Ratnapura district. Nearly 15,969 hectares of land area in the district is used for coconut cultivation. The gross extent of the paddy grown by irrigation schemes at Ratnapura district in year 2005 is around 22,793 hectares. Total of 5,605 land area of Ratnapura district is allocated for the banana and Papava cultivation. In addition, certain amount of land area is allocated for the cultivation of Kurakan, Maize, Meneri, Sroghum and Green gram.

4.5.3.2 Industries

160. In the Ratnapura district, only about 12% of the employed population is engaged in industrial activities. A total of 323 industrial establishments are found in Ratnapura district with 10,364 employments. The total number of industries and persons engaged in the district was enumerated in 2003 at 5916 and 12,727, respectively. These numbers show that the district is little developed industrially. Ratnapura district is the center of the gem industry in Sri Lanka and

contains around 80% of the gem mines. Predominant industrial activity in the district is gem mining and quarrying which account for 17% of establishments. Manufacture of chemical, petroleum, coal, rubber and plastic is also account for total of 41% of establishments. Manufacturing of food, beverages and tobacco is also fairly significant, accounting for 16%.

4.5.3.3 Infrastructure

161. In the Ratnapura district only, 10% of the housing units are provided with pipe-borne water. 35% obtain drinking water from protected wells. Yet a significant percent of housing unit in rural sector depended on unprotected wells, rivers, tanks and other sources for their supply of drinking water. Electricity is available for the most of the proposed project influential area. Flush and water sealed latrines facilities are available to only about 19% of the housing units in Ratnapura district. Indeed 14% of the housing units in all sectors of Ratnapura district do not have toilet facilities.

4.5.4 Social and Cultural Development

4.5.4.1 *Population and Community*

162. A total of 17 DS divisions are located within Ratnapura district representing all ethnic and religious groups in the country. The total population distributed in the district consists of: 86.8% Sinhalese, 2.8% Sri Lankan Tamil, 8.1% Indian Tamil, 2% Sri Lankan Moor, 0% Burgher, 0% Malay and 0.1% others. Mainly four religious groups are represented in the district - 86.6% Buddhist, 9.5% Hindus, 2.2% Muslims and 1.7% Catholics.

4.5.4.2 Health and Educational Facilities

163. A total of 47 hospitals are distributed in different locations of the district. These include single Provincial general hospital, 3 Base hospitals, 9 District hospitals, 8 Peripheral units, 6 rural hospitals, 12 Central dispensary and 6 Estate hospitals. Out of these Provincial general hospital located at Ratnapura and 4 Base hospitals are located in Embilipitiya, Balangoda, Kalawana and Kahawatta.

1. Within the district altogether 618 schools including 580 National schools, 1 special school, and 37 Privens are distributed. Generally the education level of the district is considerably high. The literacy rate of the district is 88.4%.

4.5.4.3 Sites of the Cultural, Archaeological and historical significance

164. Sri Pada is an ancient pilgrimage, which has long attracted thousands of pilgrims from perhaps all faiths, is the pilgrimage to the sacred mountain, Sri Pada, popularly known in English as Adam's Peak. It is a conical mountain 7,360 feet (2,243 meters) high, soaring clear above the surrounding mountain ranges. According to a legend, when the Buddha visited Ceylon he planted one foot on the north of the royal city and the other on Sumana-kuta (Adam's Peak) fifteen yojanas, or about hundred miles distant. Pothgul Vihare was dating back to the 1st century B.C this temple built by King Valagambahu has cave paintings and a statue of the Reclining Buddha. An interesting sculpture of a devil with his mouth open and a figure ready to jump in is a representation of the Buddha sacrificing himself in one of his 550 lives. The temple can be reached by an ascent over 450 steps. Rajasitagama are important gem mines. National Museum is representation of the prehistory of Sri Lanka, the intricate processes of gem mining and examples of the art and culture of the Sabaragamuwa province. It is located at the

Ehelapola Walawwa.

4.6 Hambantota District

No.	List of Subprojects in the Area
D-8	Embilipitiya GSS to Weniwelara
D-9	Gantry at Weniwelara

District Administrative Structure

165. The district has been divided administratively into 576 Grama Niladari divisions and 12 divisional secretariat areas. In addition there are 1 Municipal council, 1Urben Council, 10 pradeshiya saba areas and 04 electorates in the District. Under the other divisions 13 police authoritative areas, 03 zonal educational areas, 16 agrarian service divisions and 10 MOH areas are found in the district.

4.5.1 Physical Resources

4.5.1.1 Geography

166. Hambantota District which lies to the south east of Sri Lanka is 2609 km² in extent. This is 1/25 of the total land mass of Sri Lanka. Maximum length of the district is 106 kms while the maximum width is 39kms. The length of the coastal belt is 151 km. Of the total land mass of Hambantota District, 11.5 km² are covered by internal reservoirs. According to latitude and longitude situation, Hambantota District lies between 6.0 to 6.5 north latitude and 80.6 to 81.7 east longitude. This district is bounded by Monaragala, Rathnapura Districts on the north, Matara District on the west and Indian Ocean and Ampara District is on the south and Indian ocean is on the East (**Figure 19**).



Figure 19: Hambantota District Map

4.5.1.2 Geology

167. The District lies largely in a transitional zone, between the Vijayan Series and the Highland Series. Quartzites relating to both the Vijayan and the Highland Series can be found in the Walawe transitional zone, and around Ambalantota, where another promontory known as the Godawaya Headland occurs. From Godawaya to Bundala, the Vijayan Series is dominant. Rocks of this Series are exposed in the littoral zone around Hambantota and Bundala. There is a noteworthy outcrop of the Vijayan Series in the area towards the east of the Nonagama-Embilipitiya road. Outcrops relating to the Highland Series can be seen between the Kalametiya Headland and Wanduruppuwa, on the west bank of the Walawe River. Also, the region lying to the west of the Nonagama-Embilipitiya road display rocks belonging to the Highland Series. Among these rocks are Charnockites, Crystalline Limestones, and Garnet-Granulites.

168. A notable difference between the Highland and Vijayan rocks in the Hambantota District lies in their structure. The coastal area is covered predominantly by Quaternary deposits. These are evident along beaches, lagoons, lakes, estuaries, and in floodplains of rivers. The Quaternary deposits have been further sub-divided into Older and Younger groups. The Older group is of Pleistocene, and occurs at slightly higher elevations in the form of basal ferruginous gravels, terrace gravels, and red-earth formations. It was possible to identify isolated patches of these sub-groups around Hambantota, Ranna, Chitragala, Mirijjawila, Bundala, and Koholankala. The Younger group of the Quaternary deposits is of Holocene age, and comprises beach rock or littoral sandstone, beach sands, estuarine deposits, dune sands, lagoonal and shell deposits. A large part of the Hambantota district is covered by beach sands and dune sands, forming a belt of unconsolidated material, almost parallel to the coast. However, beach sands are not restricted to the littoral zone, but are seen in areas of fossilized beaches in the

intermediate hinterland. These have been re-worked by wind action as well as by fluvial action, during later times; evidences of these are seen, for example, around Kalametiya lagoon, the Walawe and Kirindi estuaries, and Chitragala. There is also a notable deposit of miocene limestone in the area around Minihagalkande.

4.5.1.3 Soil

As the map showing the Main Soil Types indicates, there are eight main soil types in the 169. Hambantota District. The most widely distributed, and perhaps the most important among them are the Reddish-Brown Earths and Low Humic Gley soils. These soils are mainly located across the central parts of the District, particularly in the interfluve areas. Reddish-Brown Earths and Immature Brown Loams are found mainly in the Intermediate Zone, particularly on rolling, hilly terrain. Red-Yellow Podzolic soils occur mainly in the wetter regions of the western parts of the District, including the wetter parts of the Intermediate Zone. Furthermore, certain limited extents of hilly areas as well as steep rolling terrains that occur towards the western margins of the Hambantota District exhibit these Podzolic soils. Thin soils with Quartz are found mainly in the eastern areas of the District, particularly between interfluves. Alluvial soils occur mainly along river beds and delta areas, and on the terraces of perennial streams. Eroded Residual soils are found in isolated patches in the northern margins of the District, mainly towards the eastern half of the region. A large part of the coastal area and its immediate hinterland exhibit Reddish-Brown Earths, with high amounts of gravel in the subsoil, and Low Humic Gley soils. Our field work revealed that certain dried-out lagoonal beds and former beach deposits may, very occasionally, display Solodized Solonetz and Grummusol.

4.5.1.4 Climate & rainfall

170. The district which comprises abundance of dry and semi-arid climatic condition has wet zonal climatic condition. This shows again the abundance of climatic variance there in. Average temperature of the district is 27.8°C and average rainfall is 111.1 mm.

4.5.1.5 Water resources (Surface Water and Ground Water)

171. Hambantota District natural drainage system comprises of rivers and 19 natural water courses. From these Walawe river, Kirindi oya, Menik ganga, Uruboku oya, Kkachchigal ara and Kumbukkan oya that flow through the eastern boundary of the district are major water courses. Although the Ridiyagama reservoir is the biggest wewa of thirteen major lakes and internal reservoirs in Hambantota district and Muruthawela and Lunugamwehera contain the highest amount of water. More amounts of lakes are situated in Tissamaharama area. Udawalawa development project, Kirama oya, Uruboku oya, Lliyangastota, Ridiyagama, Lunugamwehera, Mou ara and Kekiriobada projects are some of them. Bandagiriya, Mahagalwewa, Beragama and Muruthawela are colonies found in Hambantota district.

172. The groundwater resources in Hambantota are found either in shallow aquifers or in deep aquifers. The shallow aquifer is formed of highly weathered rock, and is often depleted of water during the greater part of the dry period. The deep aquifer is the product of natural processes of weathering and fracturing of rocks. Often it extends from 15 to 100m. in depth, and the water is tapped through deep bore holes.

173. The main source of groundwater recharge is rainfall. It must be borne in mind that the annual rainfall is low and this factor is coupled with severe variability and seasonal fluctuations. There is a high content of iron and fluoride in the groundwater. The western parts and the

District contain water that shows a high iron content, while the deep aquifers of the eastern parts of Hambantota show high fluoride levels. It must be noted that shallow dug wells are the main source of drinking water in this District.

4.5.1.6 Air quality & Noise

174. Currently in Sri Lanka Air Quality is measured using levels of COx, SOx, NOx, Ozone and Particulate matter. In 1999, air quality measurements were done for one week duration at Meegahajandura in Hambantota District. According to the results recorded CO, SO₂ levels are lower than national standards and there is no adverse air pollution problems in Hambantota district⁸.

4.5.2 Ecological Resources

4.5.2.1 Forests

175. The primary factor which influences the natural vegetation of the Hambantota District is its climate, with high temperatures, excessive evaporation, and low, variable rainfall. The nature of the soil also influences the natural vegetation. Where the soils are predominantly sandy, the moisture retention capacity is very low. Consequent upon these features, xerophytic types of natural vegetation have evolved as an adaptation to the climatic and edaphic factors of the District. Thorny scrubland and shrubs are predominant. Pathok (*Opuntia nauchalis*), Koraarika (*Aloe*), Hathawariya (*Asparagus racemogus*), are a few examples of such plants which display such adaptive mechanisms.

176. It is possible to classify the natural vegetation of the Hambantota District into six broad groups:

- Woodlands with thorny scrub: these are found mainly in the northern and eastern parts of the District.
- **Mangroves**: These occur mainly along the coastal areas, in close proximity to the mouths of rivers. Kirala (*Sonneratia acida*), Kadol (*Rhizophora*), are some common examples found in the District.
- **Saline Swamps:** Excessive evaporation along the coastal areas lead to salt encrustations, and natural vegetation types such as Suaeda occur.
- Strand Plants: These are plants that have specially adapted to the sandy soils, and they spread out along the coastal region. A few examples of such strand plants are Maha Ravanawel (*Spinifex*), Bin Tharaburu (*Ipomaea pescapre*), Gokatu (*Saphora Zeylanica*), and Muhudu Kalanduru (*Cyperus arenarius*).
- **Coastal Forests:** This zone is found more towards the inland area, and comprises of short trees and shrubs such Wetakaiya (*Pandannus*), and Diyamidella (*Barrjngtonia racemosa*). Pathok is also common here.
- Aquatic Plants associated with Inland Water-bodies: Among the more common plants are Nelum (*Nelumbium speciosum*), Pitasudu Pala (*Boerhoaria diffusa*), Olu (*Nymphaea nauchalis*), and Kankun (*Ipomaea aquatica*).

177. One of the interesting features that we were able to discover in our field investigations was that the northwestern hill slopes, and particularly Rammale Kande, was the natural habitat for a large variety of medicinal plants and herbs. Many rare plants are found in this region.

⁸ There are no officially documented air quality and water quality analyses recorded after that period.

Indigenous medical practitioners are of opinion that some of these plants and herbs contain special antiseptic properties.

4.5.2.2 Wildlife

178. Geographic diversity gives rich wildlife resources to Hambantota district. Yala and Bundala national parks located in the southeast edge of the district are the two conserved wildlife parks. Yala is one of the 70 Important Bird Areas in Sri Lanka. Of 215 bird species of the park, seven are endemic to Sri Lanka. The number of waterbirds inhabiting wetlands of Yala is 90 and half of them are migrants. Other water birds are also attracted to the Yala lagoons. Thousands of waterfowls migrate to the lagoons of Yala during the northeast monsoon. Including Sri Lankan elephant, 44 species of mammals are resident in Yala National Park, and it has one of the highest leopard densities in the world. 25 individual leopards are estimated to roam in Block I. The elephant herd of Yala contains 300–350 individuals. Sri Lankan sloth bear, Sri Lankan leopard, Sri Lankan elephant, buffalo are threatened species that Yala is harbouring.

179. Weerawila, Kalametiya are among the most accessible bird sanctuaries in the district. Elephants can be found in almost all nature reserves along with deer, wild boar, several species of monkeys, wild buffalo, peacocks, crocodiles, and indigenous and migratory birds of all varieties. The larger part of Hambantota is dry and sandy with brilliant sunshine all year round and great and little bases on the south and south east coast offers excellent underwater coral exploration sites.

4.6.3 Economic Development

4.5.3.1 Land Use and Agriculture

180. Total Land area under paddy cultivation is 33670.13 hectares. 76% of paddy cultivation is irrigated by major irrigation schemes.

4.6.3.2 Industries

181. Milk production both buffalo milk and cow milk is done in the district under animal husbandry. The coastal belt that stretches from Kudawella on the west to Pattalnangala on the east is constituent of very attractive features. Among them peaks, lagoons, bays, sand dunes and river mouths are very important. In addition to them harbors, quays and lagoons that are important with regard to the fisheries industry receive a prominent place. Kudawella, Tangalle, Hambantota and Krinda have already been developed with modern facilities. Also there are mini fishery harbors and several lagoons where fisheries industry is done. There are several saltern that contribute countries salt production this along this coastal line. Hambantota saltern, Koholankala and Palatupana salterns are included in it.

4.6.3.3 *Infrastructure*

182. The development of the district will be made a reality by some ongoing and already completed mega projects. The major objective of these projects is to create job opportunities and increase revenue Settlement Pattern of the area. Under the Greater Hambantota Development plan, several projects can be mentioned, such as Hambantota Sea Port, Mattala Air Port, Commonwealth Games Village 2018- Sooriyawewa, Dry Zone Botanical Garden, Hambantota City Centre, Administrative Complex, Conventional Centre, extension of Southern
Highway up to Kataragama, extension of Southern Railway up to Kataragama, Industrial area, Beach Park/ South Asian Beach Games, and Banking Square at Siribopura. Sixty acers of land area have been given to commercial/mixed development under Urban Block project. For a bus stand at Siribopura another 10 acres were allocated. Boutique hotels, Information centres, Museum & Performing Arts centres and Tourists sale centres are proposed under the Tower Hill Design project.

4.5.4 Social and Cultural Development

4.5.4.1 Population and community

183. Total population of the district in 2011 is 5,96,617 and 2,93,567 are males while 3,03,050 are females. Accordingly, population density per km² is 239. From the total population 97.1% are Sinhalese, 0.4 % are Sri Lankan Tamil and 1.1% represent Sri Lankan Moors. According to the religion 96.8% are Buddhists 0.2% are Hindus and 2.5 % are Islamists.

4.5.4.2 Health & Education

184. Hambantota district has 03 Educational Zones. There are 10 MOH areas in the district.

4.5.4.3 Sites of Cultural, Archaeological and Historical Significance

185. There are two different views about the name Hambantota of them more popular view is the quay to which sea vestal "hamban" come become Hambantota. According to Professor Senarath Paranavitharana, this quay became Hambantota because Malay sea vessel arrived at this port. This Land areas coming under Hambantota District is a land mass that provides a good basic to great Sri Lankan history and culture. It was a part of historic Ruhunu Kingdom.

This area has contributed much in the creation of free nation civilization, pure Buddhist 186. culture in Sri Lanka. They were the Ruhunu kings who came forward to save the heritage at a time the Anuradhapura and Polnnaruwa came under south Indian invasions. Also those who supported King Dutugamunu, Datusena and Wijiyabahu to unite the country were Rohanu People. At a time, the Buddha Sasana faced threats, it found security in Rohana Temples. They were rohana paddy lands that provided rice to the country at times when people in Anuradhapura Kingdom faced famine and the Sinhalese fought for the freedom. Hambantota is important as a part of the great Rohana Region. It is said that up country kingdom got salt from Hambantota saltern when the country ws under Portuguese rule. Hambantota was further developed as a harbor and an urban habitat area by British. Accordingly, they built in Hambantota a Kachcheri, government departments, Schools, a Police station, a Hospital and a court and diverted Hambantota as the leading administrative town. During British era Hambantota had been divided into three areas as west Giruwapaththu, East Giruwapaththu and Magampaththu. They comprised of 72,36 and 28 village headman divisions respectively of these three areas and Magampaththu was the biggest area in respect of the land extent.

4.7 Galle District

No.	List of Subprojects in the Area
D-11	Augmentation of Beligaha PSS
D12	Matugama GSS to Bentota PSS

187. **Figure 20** shows the Galle District.

4.7.1 Physical Resources

4.7.1.1 Topography, Geology and Soil

188. The project-affected area is located within the district of Galle in first peneplane, which has an elevation from Mean Sea Level (MSL) of 125 m. The terrain of the project-affected area is rolling, undulating and steep. Geologically, Galle District falls within the rock formations of the Southwestern group and is made up of shists, geneisses and granulites of meta-sedimentary origin, as well as migmatite and granitic geneisses. The Southwestern group is believed to form during the Archaeozoic period. In accordance with the agricultural soil classification the project affected area is located within Wet Zone of Low Country region - 4. Thus the main soil types are Red, Yellow podzolic, Red yellow podzolic soils with strongly mottled sub-soil, Low Humic Gley and Bog and Half-Bog soils. The low humic gley soils occupy the lower parts of the slope and upper parts of the valley bottoms.



Figure 20: District map of Galle

4.7.1.2 *Climate*

189. The local rainfall pattern is influenced by the monsoon winds of the Indian Ocean and Bay of Bengal. The annual average rainfall of the island varies from below 1,000 mm over a small region in the arid parts of North West and South East to over 5,000 mm in the very wet regions. Galle district is located within the Wet Zone of Sri Lanka and experiences an annual rainfall of more than 2,400 mm. The peak rainfall period is associated with the precipitation from the South West monsoon during May to September, which brings the moisture from the Indian

Ocean. The lowest rainfall is recorded during December to February of Northeast monsoon period. There is only a slight annual range of temperature for the island, but this is exceeded by the diurnal range of temperature. Average daily temperatures of the district range between 25°C and 30°C, remaining fairly constant throughout the area. The highest temperature is observed during February to April season. Humidity is typically higher in the South West region of the country and depends on the seasonal patterns of rainfalls. Daytime humidity stays above 70-80% all the year, rising to almost 90% during the Monsoon season.

4.7.1.3 Water Resources (Ground Water and Surface)

The groundwater availability varies within the district depending on the geology and the 190. rainfall. Ground water is the main source of potable water in rural areas of the Galle district. During the dry season, majority of the shallow wells located within coastal areas experience salinity intrusion. The quality of the ground water is fairly good in rural and some semi-urban areas in the district. Surface water resources in Galle district are abundant with rivers that radiate from the central highlands.

Halwathura Ganga, Gin Ganga, Holuwagoda Ela, Madampe Lake, Keembiya Ela are the main natural water resources located in and around the proposed project area. Surface water quality of the main streams located in rural sections is fairly good while urban areas are contaminated with industrial and other waste. The intensive rainfall causes flood in Galle district during the South West (May to September) and North East (November to February) monsoon seasons. Madampe Lake is connected to very famous wetland, which is known as Madu Ganga. Thus any construction activity that has adverse environmental impact to the Madampa Lake will lead to cascade adverse impacts on the Madu Ganga too. Madu Ganga is a very famous destination of local and foreign tourists. Thus, it is advisable that any construction activity along the Madampe Lake must be done with utmost care without causing contamination of the lake by effluents.

4.7.1.4 Air Quality and Noise

Concentrated road traffic or presence of air polluting industries in the area can result in a 191. significant decline in air quality. Since most of the distribution line tower locations and the substation are located in rural and semi-urban areas, the Ambient Air Quality measurements along the project road are within the limits of National Ambient Air Quality Standards. National Ambient Air Quality Standards, diurnal pattern of ambient air quality parameters such as CO, SO₂ and NO₂ indicates that mobile sources have made major contributions to air pollution in these locations. Table 14 Indicates that air quality monitoring was less that the national standards in Galle town in 1999⁹. Noise levels attributable to traffic and industrial activities are lower in rural areas, while noise level is high in industrialised areas urban centres where the traffic volume is high along the Class A Colombo-Galle road.

Table 14: Air Quality Monitoring at Galle town in 1999				
Parameters	Galle District	National Standard for One Hour		
CO concentration (ppm)	1	26		
NO ₂ concentration (ppm)	0.01	0.12		
SO ₂ concentration (ppm)	0.005	0.08		

9 No other official data is available for Galle after this period.

PM10 concentration (µgm-3)	40	65		
0 051				

Source: CEA

4.7.2 Ecological Resources

192. The aquatic and terrestrial ecosystems distributed in Galle district provide important ecological and biological habitats for variety of floral and faunal species. Hikkaduwa Marine National Park and several sanctuaries (Telwatta, Honduwa Island, Eluwilayaya, Rumassala) are located within the coastal zone of the district. However, the above sanctuaries are located more than 10 kilometres away from the project area. Beruwala, Hikkaduwa, Galle and Unawatuna are famous coral habitats among the costal ecosystems. Kottawa forest reserve is situated in North East of Galle along the main road to Udugama Township. Hiyare rainforest is a reservoir bounded by 600 acres of secondary lowland and an excellent spot for over 80 species of birds, out of which 10 are endemic and can be seen in Hiyare.

193. None of the above-mentioned environmentally sensitive areas is located in the vicinity of the proposed project. Thus proposed project activities will not affect the fauna and flora of environmentally sensitive areas. However, there are some mammals species, which traverse across the project-affected areas, have to be protected under the existing legal measures in Sri Lanka (Fauna and Flora Protection Ordinance). The available fauna and flora of the project-affected area are mainly common home garden species of the Southern Province (low country wet zone of Sri Lanka). **Table 15** indicates the list of tree species that have been cut/removed from the ROW of the proposed distribution line.

Family	Species	Local Name	TS
Anacardiaceae	Mangifera indica	Amba	I
Arecaceae	Areca catechu	Puwak	Ν
Arecaceae	Caryota urens	Kitul	Ν
Arecaceae	Cocos nucifera	Pol	Ν
Clusiaceae	Calophyllum inophyllum	Domba	Ν
Clusiaceae	Garcinia quaesita	Goraka	Е
Azadirachta indica	Kohomba	Kohomba	Ν
Euphorbiaceae	Hevea brasiliensis	Rubber	I
Fabaceae	Albizia saman	Para Mara	I
Fabaceae	Gliricidia sepium	Weta Mara	I
Fabaceae	Tamarindus indica	Siyabala	I
Meliaceae	Melia azedarach	Lunu Midella	Ν
Meliaceae	Swietenia macrophylla	Mahogani	I
Moraceae	Artocarpus hetarophyllus	Kos	I
Moraceae	Artocarpus incises	Del	I
Moraceae	Artocarpus nobilis	Wal Del	E
Moraceae	Ficus religiosa	Во	I
Poaceae	Bambusa vulgaris	Una	Ν
Rutaceae	Aegle marmelos	Beli	I
Sapindaceae	Nephelium lappaceum	Rambutan	I
Sapotaceae	Madhuca longifolia	Mi	Ν
Verbenaceae	Tectona grandis	Tekka	

Table 15: Economically Important as well as Valuable Timber Species recorded along Proposed distribution Line*

Abbreviations: TS: Taxonomic status E: Endemic N: Native I: Introduced

* Some of these species have been removed from area along the ROW of the proposed distribution line.

4.7.3 Hikkaduwa Marine National Park

194. Hikkaduwa National Park is an IUCN Category II National Park. Hikkaduwa coral reef is a typical shallow fringing reef with an average depth of around 5 metres. The coral reef reduces the coastal erosion and forms a natural breakwater. The coast of the national park extends four km. Generally the coast is narrow, ranging from 5-50 m according to the climatic conditions of the year. Scuba diving is a popular recreation here. The national park situated in the wet zone and receives a 2,000 millimetres (79 in) of annual rainfall. The rain is received in both southwestern and northeastern monsoon seasons, in April-June and September-November respectively. Inter-monsoon season is a dry period, which is considered the best season to visit the park. The temperature of the water ranges from 28.0°C-30.0°C while the mean annual temperature is 27°C of the atmosphere.

195. Foliaceous Montipora species dominate the coral reef. Encrusting and branching species are also present. Faviidae and Poritidae corals are contained in the inshore areas of the reef in massive colonies. Staghorn, elkhorn, cabbage, brain, table and star corals are all present in the reef. Corals of 60 species belonging to 31 genera are recorded from the reef. The reef also recorded over 170 species of reef fish belonging to 76 genera. Seagrass and marine algae belonging to genera Halimeda and Caulerpa are common in the seabed depth ranging from 5-10m. Seagrasses provide habitat to Dugong and sea turtles. Some species of prawns feed on the seagrass. Eight species of ornamental fishes also inhabit the reef, along with many vertebrates and invertebrates including crabs, prawns, shrimps, oysters and sea worms. Porites desilveri is an endemic coral species of Sri Lanka. *Chlorurus rhakoura* and *Pomacentrus proteus* are two reef fish species confined to Sri Lanka. Blacktip reef shark are found along the outer slope of the reef. Three sea turtles which have been categorized threatened visit the coral reef: the hawksbill turtle, green turtle, and Olive Ridley.

4.7.4 Madampe and Maduganga Lakes Wetland

196. The lakes Maduganga and Madampe are located on the southwestern coast of Sri Lanka in the Indian Ocean. They are twin lakes connected by a narrow channel of 3 km in length. The surface areas of the lakes cover 915 hectares and 390 hectares, respectively.

197. According to a survey conducted by the Coastal Conservation Department of Sri Lanka the total population living in the vicinity of Lake Maduganga is nearly 24,150. 19,360 people live around the lake Madampa Ganga. The people depend on the resources available from the lakes and surrounding wetland systems. Though, there is neither an adequate management nor environmental awareness programme, by which the local farmers and fishermen learn about sustainable use of the environment. The area already has encountered severe damage e.g. due to over-fishing, emissions of pollutants into the water system or the extensive use of chemical fertilizers.

198. According to a study conducted by the IUCN in 2000 – Maduganga Lake has one of the most unique biodiversity including different vegetation types such as the predominating mangroves and marshlands. The Maduganga wetland consists of 10 major vegetation types. These vegetation types comprise a total of 303 species of plants belonging to 95 families. The total plant species included 19 endemic and nationally threatened species and 9 invasive alien species. Examples of endangered plants are a dominant canopy plant Shorea affinis.

199. Due to the broad variety of plants, a large number of invertebrates, reptiles, including

snakes, birds, amphibians, and mammals can be found around Lakes Maduganga and Madampa Ganga. Whereas the Mugger (*Crocodylus palustris*) is considered to be vulnerable and the purple-faced Leaf Monkey (*Trachypithecus vetulus*) endangered other reptiles such as the estuarine Crocodile (*Crocodylus porosus*), Flapshell Turtle (*Lissemys punctata*), Indian Python (*Python molurus*) are not considered in the red list yet.

200. The mixture of vegetation types and presence of 21 small and large islands within this twin lake has made these two wetlands an ideal habitat for a great variety of birds. A total of 111 bird species (48 families) were recorded. These represented approximately 43% families of the Sri Lanka native avifauna population. Of these native species 6 are endemic while 7 are considered as nationally threatened. Some of the birds were listed in the IUCN red list, such as the Sri Lanka bush warbler, *Bradypterus palliseri*, Columba torringtoni (Ceylon bush pigeon) and Myophonus blighi, the Sri Lanka whistling thrush. Additionaly, about 10% (13 species) of Lake Maduganga birds are winter migrants.

4.7.5 Economic Development

4.7.5.1 Land Use and Agriculture

201. Land use pattern in the project area varies from semi-urban to rural. The semi-urban areas include townships and built up dwellings. Few ribbon type developed commercial centres are also located within the project influence area of semi-urban section. Outside the semi-urban areas, settlements become rural featuring more residential use, agricultural land including paddy, large-scale tea, rubber, cinnamon, coconut and mixed agricultural lands. The economy of Galle district is mainly based on tea, rubber, coconut, paddy, and cinnamon cultivations with a long history of cultivation for exports. A total of 24,920 hectares of tea, 6,518 hectares of rubber, 12,543 hectares of coconut and 23,912 hectares of paddy was cultivated in 2002 within the Galle district.

4.7.5.2 Industries

202. There are 789 industrial establishments in Galle district and nearly 15,000 people are engaged in these industries. Main industrial operations in the district are concentrated in Galle include- cement, garment factories, wood and food processing industries. Koggala is the 2nd pre trade zone of Sri Lanka located within the district. Large numbers of agro-processing industries (Tea, Rubber and Cinnamon) are also distributed in semi-urban and rural areas of the district. Industries in the vicinity of the distribution line mainly consist of garment manufactures, Tea and Rubber factories including other agricultural based factories. The project-affected area comprises of private sector hotel industries and footwear industry closer to the New Galle Substation.

4.7.5.3 *Tourism*

203. The southern coastal belt is the most popular among the tourists who visit mainly from October through April when the monsoon moves North East and the sea becomes calm with blue skies.

4.7.5.4 Infrastructure Facilities

204. Electricity and telecommunication facilities are available for almost all project-affected area within the Galle district. Pipe-borne water facility is available for most of the urban and

semi-urban places except rural areas of the district. Pipe-borne sewerage facilities and proper pit latrine facilities are available in urban areas of the Galle district. Sanitation facilities in the project area are available mainly for onsite facilities for homes and institutions.

4.7.6 Social and Cultural Development

4.7.6.1 *Population and Community*

205. The distribution line would traverse through Karandeniya, Ambalangoda and Galle DS divisions. The gender wise distribution of population in these DS divisions has been tabulated below. The total number of population of district of Galle is 990,487 out of these 481,849 are male and 508, 638 female. Also, **Table 16** indicates population statistics relevant to the DS divisions. Out of the total population 94.4% are Sinhalese, 1.1% are Sri Lankan Tamil, and 0.9% are Indian Tamil.

Name of District/DSD	the Total Population	Male Population	Female Population
Karandeniya	56,128	27,213	28,915
Ambalangoda	71,047	34,395	36,652
Akmeemana	63,881	30,332	33,549
Baddegama	68,634	33,161	35,473
Bope – Poddala	41,612	19,952	21,660

Table 16: Population distribution of DS divisions

Source: http://www.statistics.gov.lk (Population by D.S. Division, Census 2001)

4.7.6.2 Education

206. Education facilities in the district are considerably high compared to other 2 districts of the province. Total of 492 schools are located in the district including 425 government schools and 65 pirivenas with 223,053 pupils. Literacy rate of Population in District of Galle at a significantly higher level, which is 92.3% compared with other districts (Anuradhapura, Pollunuruwa, Badulla Monaragala, Hambantota etc.)

4.7.6.3 *Health Environment*

207. Two teaching hospitals (Karapitiya and Mahamodara), 3 base hospitals, 6 districts hospitals, 9 peripheral unit and 4 rural hospitals are located in the Galle district for the public's health services. Additionally few private hospitals are also located in urban centers while number of dispensaries distributed in rural areas of the district. The project site is situated in a very good climatic condition; there is no air, noise, water and industrial pollution. Health environment is very good.

4.7.6.4 Historical, Cultural and Archaeology Sites/Places

208. The most important cultural and historical site of the attraction is Dutch fort located within the boundary of Galle town. UNESCO declared this magnificent site as a 1st World Heritage Site within the Galle district. In addition Dutch Reformed Church, Dutch Museum and several places in Koggala area have significant cultural and historical importance within the Galle district. Koggala is the home town of a famous local writer Martin Wickramasinghe. The museum of Folk, Art and Cultural built in his honor at his old residence has an excellent display of local folk

items. The beautiful beach of Unawatuna is just 6 km South East of the city centre. The Seenigama Devalaya is most significant cultural and religious importance site located within the coastal area of the Galle district. However, there are no archaeological, historical importance sites or protected monuments in the study area along the alignment. There are some locally important religious places are situated on either side of the access roads in project area but are away from the route alignment.

4.8 Kalutara District

No.	List of Subprojects in the Area
D12	Matugama GSS to Bentota PSS

4.8.1 Physical Resources

4.8.1.1 Topography, Geology and Soil

209. Kalutara District is located in the south west of Sri Lanka and has an area of 1,598 km² (**Figure 21**). Roughly the population is calculated at 761 persons per km. It is divided into 14 Divisional Secretary's Division (DS Divisions). The DS Divisions are further sub-divided into 762 Grama Niladhari Divisions (GN Divisions). Kalutara District is bordered by the sea to the west, Ratnapura District to the East, Galle District to the South and Colombo District to the North. The capital city Kalutara is located 40 km south of Colombo. Kalutara town is of special importance as a capital to Kalutara district, where not only the main service center of the district is located but also a town of religious importance due to the location of the sacred Kalutara Bo Tree and other religious buildings.



Figure 21: Kalutara district map

4.8.1.2 Climate

210. Kalutara District is in the wet zone and the main characteristics of the climate are high rainfall, high temperature and high humidity throughout the year. The monsoon seasons extending from May to August and October to January include heavy rains, slightly lower temperatures periods of lower humidity. On average, the temperatures are always high, on average, the warmest month is January, and the coolest month is September. Average temperature is about 27°C and annual rainfall varies within 1500- 2200mm.

4.8.1.3 Geology and Soil

211. Red- yelllow- podzolic soils with soft or hard laterite and bog soils are recorded from Kalutara district. Generally, majority of the lands of the Kalutara district are high elevated ones. But it is estimated that 7.28 % of the total land area of the Kalutara district has been inundated during the flood occurred in June, 2008 (mainly in low lying areas). Highest percentage of flooded area covered by paddy fields (about 52.67 %) and followed by Rubber (25.34%), Home gardens (15.8%) and it can be observed that somewhere of all class A and B roads and minor road of the district have been submerged by flood water.

4.8.2 Economic development

212. The labor force participation rate expressed as the percentage of employed and unemployed persons to the population aged 10 years and over, is 44.5%. The largest share of the employed population is engaged in an elementary occupation and skilled agricultural fisheries. The employment rate is 89.7% and the unemployment rate is 10.3%.

213. The main source of income for the people is agriculture. Although paddy cultivation is practiced, the yield is extremely poor. Horticulture at the domestic level is practiced extensively. The most common fruit grown in the district is Mangostine. Toward the interior, rubber and cinnamon are grown to a large extent.

214. The total number of household in the district is 269,864. Of the total, 78.5% are permanent houses, 20.1% are semi-permanent houses, 0.4% is improvised houses and 1.0% is not classified. 72.5% of households have electricity and the remaining 27.5% use kerosene for lighting.

Minerals

215. In Kalutara district, Meegahatenna which is located in the south of Agalawatte, was one of the sites of graphite mines which produce some of the highest quality graphite in the world. High quality graphite are also found in 56 km² area located in Matugama in Kalutara district.

4.8.3 Ecological resources

216. Kalutara district has several types of land type as lowland rain forests, sparse forests and riverine forests. Total area of the Low land rain forests is about 140.21 km² and total area of the sparse forests is 45.75 km^2 (**Table 17**).

Name	Category	Extent (ha)
Delmella Yatagampitiya	PR	1413.3
Diwalakada	PR	144.3
Haycock	FR	362.0
Ingiriya	FR	282.6
Kaharagala	PR	31.8
Kalugala	PR	4288.0
Kudaganga	FR	137.4
Kurana Madakada	PR	1161.4
Mahagama	FR	227.1
Meegahatenna	PR	277.4
Morapitiya-Runakanda	PR	6732.5
Neluketiya Mukalana	PR	2384.4
Pelawatta	FR	110.0
Plenda West	PR	145.3
Ranwaragalakanda	PR	192.1
Wagawatta	PR	113.0
Yagirala	FR	2390.2
Vellihallure	OSF	425.0
Boralugoda	OSF	100.0

Table 17. Name, category and the extent of Forest Reserves in Kalutara district

FR- Forest Reserve, PR- Proposed Forest Reserve, OSF- Other State Forest

Rivers and streams

217. Maguru ganga starts from Dothalugala kanda in Sinharaja reservation area and from there, it joins with the Ratnapura district boundary and stretches towards the north western direction and then extends through the highest mountain rangers of the Kalutara district and pass through the Thikel Kanda, Dothalan kanda, Rusigala, Dalukgala and came along with the Halukiridola a certain extent up to the Kukulu ganga and again extends along the north western direction. Kalu ganga has a heavy water flow.

4.8.4 Social and Cultural Development

4.8.4.1 Population

218. Kalutara District's population was 1,217,260 in 2012. The majority of the population is Sinhalese, with a minority Sri Lankan Moor and Sri Lankan Tamil population. The population density of Kalutara district is 760/km². The male population representing 48.53% amounts to 590,736 persons. The female population accounts for 626,524. On a community basis, Sinhalese accounts for 1,054,878 persons. This is 86.66% of the total population of the district. Muslims accounts for 112,276 persons and Tamils accounts for 47,973 persons. In categorizing the population on the basis of religions, 1,016,632 persons are Buddhists, 114,422 belong to Islam and Hindus and Christians account for 39,773 and 46,109 respectively.

4.8.4.2 Health Facilities

219. In Kalutara district, 95.3% of households have access to sanitary latrines and 84.5% of households have access to safe drinking water.

220. Within the district one general hospital is established; Kalutara / Nagoda hospital, two base hospitals are there as; Panadura and Horana, six district hospitals are there and several rural hospitals and Peripheral Units also present.

4.8.4.3 Educational Facilities

221. Total number of government schools in the Kalutara district is about 414 and sixteen out of this are national schools, fourteen of them are provincial schools and others are categorized under primary and secondary schools.

4.8.4.4 Sites of Cultural, Archaeological and Historical Significance

222. Kalutara district is endowed with a proud historical heritage. It has been reported that in the past Kalutara district had been divided into 5 divisions called Kalutara thotamuna, Panadura totamuna, Pasyodun Koralaya east, Pasyodun Koralaya west and Rigam Koralaya. According to historical documents it was identified as "Pas Yoththa", during the period when Sri Lanka was administered under the regime of Ruhunu, Maya, Pihiti, at the time Kalutara district belonged to the Maya Rata.

223. Fa hein caves are considered as a very important historical site in the Kalutara district. The cave is important for the Late Pleistocene human skeletal remains. Radiocarbon dating indicated that the cave had been occupied from about 33,000 to 4,750 years ago. At the same time, it is mentioned that those caves are named after the Buddhist monk Fa hein.

5.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

5.1 Environment Impacts and Mitigation Measures

224. The potential environmental impacts associated with the subprojects occur during the pre-construction, construction, and operation phases, which will typically involve:

- Removal of vegetation, including trees and crops for access roads.
- Excavation of sites for project facilities (if at all), including transport and disposal of excavated materials, erosion at construction sites, possible noise/dust pollution, and management of workers and waste.
- Trenching activities breaking underground cables.
- Impacts of Polychlorinated Biphenyls (PCB)¹⁰ during transformer replacement process, and improper disposal of transformer containing PCB, if required.
- Spills of fuel and other lubricants at the construction site/workshop/repair site that may affect soils and water quality.
- Noise from construction equipment.
- Preservation of cultural sites and artefacts.

5.1.1 Environmental Impacts and Mitigation Measures Needed during the Design/Pre-Construction Phase

5.1.1.1 Route Selection

225. As per the Forest Conservation Act, all the power lines infringing upon the ecologically sensitive areas¹¹ have to be approved by the CEA. Approval from CEA will be obtained well in advance for all the subprojects that infringed on forestlands. Forests are avoided as far as possible while selecting the distribution line route. Where it is not possible to avoid forests, the routing of the lines in the forest area will be done in consultation with respective forest authorities to minimise damage to the forests and to ensure minimal impact on wildlife.

226. The natural terrestrial environment of the proposed project areas in Anuradhapura, Colombo, Galle and Hambantota has already been significantly altered and disturbed by mankind for conversion into paddy fields, tea, rubber and other mixed cultivations, villages, semi-urban areas with infrastructure facilities such as roads, drains, homes and buildings etc. under various development projects. Therefore, besides cutting of plantation trees, tea and home gardens, the subproject should not cause any significant impacts to the existing environment nor affect any environmentally significant areas.

227. The overhead conductor must not affect any of the sewerage/drainage system, as well as no streams should be disturbed. Apart from limited disturbance during construction, there should be no long-term effects on water quality.

228. Care must be taken that line routes must avoid wetlands and unstable areas. The routing of the lines is selected to avoid relocation of people and threats to common property

¹⁰ Polychlorinated Biphenyls (PCB) are mixtures of man-made chemicals and due to their non-flammability, chemical stability and high boiling point have been used extensively as insulators. PCB's are highly stable, toxic and persistent chemicals. Their manufacture, processing and use has now been banned in many countries. (USEPA web page on PCBs).

manufacture, processing and use has now been banned in many countries. (USEPA web page on PCBs). ¹¹ Environmentally Sensitive Area (ESA) is a type of designation for an area which needs special protection because of its landscape, wildlife or historical value.

resources. Engineering and biological measures must be taken to prevent soil erosion, impact on agricultural land en-route the line must only be restricted to the construction phase, and adequate compensation as determined by the district authorities must be paid to the affected persons.

229. The transformers and other equipment used in the project must be free from polychlorinated biphenyl (PCB). Production of PCBs has now been banned in most countries and it will be phased-out in 2025, therefore equipment (transformers), if procured under the loan should not contain PCBs. Procurement of new transformers will specify that PCB should not be used and only non-PCB coolant such as hydrocarbon mineral oil will be used. At any stage, during transformer replacement process, if presence of PCB in the existing transformers is confirmed, the Engineering, Procurement, and Construction (EPC) contractor will adopt best industry practices with regard to handling of hazardous materials, implement it within its already existing work and safety handling procedures, and will recommend the appropriate disposal of these equipment in accordance with the applicable National and International standards.

230. Batteries and transformer oil must be disposed of through lead waste re-processors in accordance with the provisions of CEA and compliance with these provisions must be reported to ADB/CEA through biannual reports.

231. No major sites of archaeological, cultural, or historic significance are present along the proposed alignment of the distribution lines and gantries.

5.1.2 Environmental Impacts and Mitigation Measures Needed during Construction

232. Environmental impacts identified during construction are limited in size and are temporary. The scale of the works is relatively minor and the project areas proximity to the work force means that no construction camps are required.

233. Fuel and other lubricants will need to be stored at the construction sites. Best industry practice will be required to ensure that accidental spills and discharge to the soil and aquatic environments are prevented. Any fuel (including drums and tanks, if any) should be placed at least 30 m away from waterways and no equipment is to be refuelled within this distance.

234. Only trained personnel should undertake handling of fuel and lubricants. In addition, machinery should be properly maintained and waste oil and oil filters must be disposed of to meet best industry practice. This will be the contractor's responsibility.

235. At the completion of work, the contractor will be required to rehabilitate and clean up all work sites. This includes repairing damage to pavements, roads, and drainage systems. All waste is to be removed from the sites. The contractor and CEB will be responsible for implementing this requirement.

Removal of Trees

236. The project may require some fruit/non-fruit trees to be removed during the construction activities. **Table 18** gives the list of trees to be felled for this component. Approximately 617 forest trees and 1216 fruit/nonfruit/plantation trees will be removed from the RoW¹² of the

¹² The ROW is10 m for the distribution line. Few scattered trees are found in the area but not necessary to cut down for the distribution line.

distribution lines. These would include shading timber, plantation species as well as edible fruit species. The initial construction works along the alignment involving land clearance, cutting, filling, and levelling may cause loss of vegetation. This will be irreversible impact. Care has been taken to avoid the thick plantations/vegetation as far as possible and tower locations are selected at plain paddy fields where the vegetation is thin. This will minimise the tree loss.

237. In Sri Lanka normally, for compensatory reforestation or afforestation program if the line goes through a forest area where trees have to be cut, the Forest Department make an inventory of trees to be cut and the area devoid of trees. CEB is then required to fund the reforestation program in the nearby area (or they might already have reforestation program prepared for the district) which is roughly \$ 2000 per ha and the plantation is done at 1:1 replacement basis.

238. Compensation will be paid to the tree owners in the private areas as per GoSL norms. In home gardens, if trees have to be removed, CEB pays compensation to the owner. For example, if a coconut tree has to be cut and it produces a good yield, then the maximum SLR 55,000 (\$ 425) is paid to the owner. This amount was calculated by Coconut Development Board. If a coconut seedling is uprooted for the line the compensation is SLR 1000 only. For timber trees e.g. Jak, Mahogany, Sapu, Lunumidella, Mango, the amount to be paid is decided by the Divisional Secretary or Grama Niladhari. The amount varies according to the tree species, height and diameter, quality of the tree etc. based on the market value of the tree.

No	Sub-Project Details	Private Land	Forest Land	
		Total	Total	Total
		number of	number of	number of
		fruit trees	Non fruit	forest trees
		to be felled	trees to be	to be felled
D-1	Old Anuradhapura GSS to	34	129	103
	Mahailuppallama Gantry			
D-2	Gantry at Mahailuppallama	1	1	1
D-3	Ethgala Gantry to Storefield Gantry	5	92	0
D-4	Gantry at Ethgala	6	30	0
D-5	Kappalthurai GSS to Chinabay Gantry.	0	63	490
D-6	Gantry at Chinabay	0	0	23
D-7	Augmentation of Ethulkotte PSS	0	0	0
D-8	Embilipitiya GSS to Weniwelara	94	140	0
D-9	Gantry at Weniwelara	0 (paddy)	0	0
D-10	New PSS at Rattanapitiya	0	0	0
D-11	Augmentation of Beligaha PSS	0	0	0
D12	Matugama GSS to Bentota PSS	250	371	0

Table 18: Total Numbe	r of Trees to be	e felled for this	component
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Impact on Air Quality and Noise Levels

239. Noise, vibration, and emission from construction vehicles and equipment will occur during construction and pre-construction stages in temporary manner. During the construction phase, the activity would involve excavation for the tower erection, movement of transporting vehicles carrying the construction materials etc. along the haul road (through un-built roads, but

are not maintained). At majority of locations, movement of vehicles may not be possible; from approach road to construction site material will be head loaded. All these activities would give rise to emission of dust particles thereby affecting air quality marginally at the site which although will be transitory in nature. Sprinkling of water during excavation will reduce the dust emission to a great extent. The major work of the construction is expected to be carried out during the daytime. The noise produced during the construction will have negligible impact on the residents as the predominant land use along most part of the alignment are paddy fields/coconut trees, tea and rubber plantations area. There will be very limited presence of population being exposed to noise generated during the construction phase. The sites of subprojects are located in Pradeshiya Shaba, Urban or Municipal Council areas. The surrounding land area considered as 'Low Noise area' for Pradeshiva Sabah and 'Medium Noise area' for Urban or Municipal councils according to the Gazette Notification No.924/12, 1996 on National Environmental (noise control) regulations No. 1. Under this regulation maximum permissible noise levels for low noise area at boundaries are 55 dB(A) and 45 dB(A) for day time (06 00h - 18 00h) and night time (18 00h - 06 00h) respectively. For medium noise area these values are 63 db (A) and 50 db (A) for day time and night time, respectively. However, for construction activities in any area, the maximum permissible noise levels at boundaries are 75 dB(A) and 50dB(A) for day time (06 00h - 21 00h) and night time (2100h - 0600h) respectively.

240. Following measures will help to keep noise and vibration in acceptable level during construction phase:

- Contractor shall equip their heavy construction equipment and plants with exhaust silencers to limit the engine noise so as not to exceed 75 db (compacters, loaders, vibrators and cranes) and regularly maintain all construction vehicles and machinery that should meet the National Emission Standards.
- Contractor shall limit working time for activities that create noise only from 6.00 am to 6.00 pm except for construction site near public sensitive receptors. Construction related activities closer to sensitive receptors have to be scheduled in coordination with the relevant authorities.
- Contractor and its suppliers of construction materials should strictly implement noise control regulations stipulated by the CEA in 1996 (Gazette Extra Ordinance, No 924/12 mentioned above) for all construction vehicles and equipment.

Waste Disposal

Solid/Liquid Waste Disposal

241. The solid waste generation will be at the location of the tower erection site which will include metal scraps, wooden packing material etc. Wooden waste and metal scrap will be collected and disposed of offsite in compliance with applicable regulations and rules. There will be no oil or chemical waste generated during the construction of distribution line/gantry or power substation, hence no mitigation is required.

Sanitary Waste Disposal at Construction Sites and Labour Camps

242. The labour camps at the site of tower erection will be temporary in nature and the human excreta will not be significant to cause contamination of groundwater. Those places where most labour will be staying will be near hamlets, which shall use the community services for solid waste, water and sanitation. Adequate drinking water facilities, sanitary facilities, and drainage in the temporary sheds of the construction workers should be provided to avoid the surface water pollution. Provision of adequate washing and toilet facilities by the contractor to the

workers should be made obligatory. This should from an integral component in the planning stage before commencement of construction activity.

Health and Safety

243. Health and safety impacts¹³ will be in terms of risk of accidents along the alignment. The accidents may be caused due to electrocution, lightening, fires and explosions. To avoid this, houses will be allowed within the RoW of the project, only if the stipulated safety clearance specified within CEB norms is met with (specified in **Annexure 1**). Necessary training regarding safety aspects to the personnel working at the line will be provided by the contractor. Personal protective equipment like safety gloves, helmet, mufflers etc. will be provided during construction period and during the maintenance work. First aid facilities will be made available with the doctors called in from nearby towns when necessary. Workers are also covered by the statutory workmen compensation as per GoSL laws by the contractor.

5.1.3 Environmental Impacts and Mitigation Measures Needed during Operation

244. Once gantry switching stations and lines are fully erected, fencing, danger signs must be installed at each that clearly identify and warn of the dangers of climbing into an operational substation. Signage meeting the IEEE¹⁴ standards will need to be placed on all overhead towers warning of the electrical hazards. Erection, Procurement, and Construction (EPC) contractor will also need to advise the community about the location and associated dangers of the overhead feeder line.

¹³ Follow World Bank EHS Guideline for Electric Power Transmission and Distribution.

¹⁴Institute of Electrical and Electronics Engineers.

6.0 ANALYSIS OF ALTERNATIVE

6.1 CEB'S Approach for Route Selection

245. At the planning stage itself, one of the factors that govern the establishment of the distribution line is the infringement of populated/forest/cultivated area and scarce land. Wherever such infringements are substantial, different alternative options must be considered. During route alignment, all possible efforts are made to avoid the populated/forest/cultivated area infringement completely or to keep it to the barest minimum. Whenever it becomes unavoidable due to the geographical locations/terrain, mitigation costs involved towards avoidance needs to be worked out. While identifying the distribution system for a generation project or as a part of distribution grid, preliminary route selection is done by CEB based on the interpretation and walk over surveys according to the 1:50,000 maps/topographical maps of the area.

246. For selection of optimum route, the following points are taken into consideration:

- The route of the proposed express lines/gantry location/PSS does not adversely affect any human habitation.
- Any monument of cultural or historical importance is not affected by the route of the distribution line or gantry/PSS location.
- The proposed route of distribution line/location of gantry/substation does not create any threat to the survival of any ethnic community.
- The proposed route of distribution line/location of gantry/PSS does not affect any public utility services like playgrounds, schools, other establishments etc.
- The line route does not pass through any sanctuaries, protected park etc.
- The line route/gantry or PSS location does not infringe with area of natural resources.

6.2 Alternatives for Line Alignment

247. The subproject will put up new gantry based switching station on feeders and auxiliary 33/0.4 kV transformer. The work will be carried out by setting up gantry based structures on poles and seek 20 m right-of-way (RoW) clearances for 33 kV express distribution lines. The CEB norms for setback and other parameters are given in **Annexure 1**.

248. For selection of optimum route, the following points are taken into consideration:

- As a principle, distribution alignments generally pass through major towns but whenever possible, to account for future urban expansion, the minimum RoW distance (total 20 m for 33 kV lines as per CEB norms) shall be kept 10 m away from any houses or structures.
- Construction activities do not adversely affect the population living near the proposed lines and does not create any threat to the survival of any community or any public utility services like playgrounds, schools, other establishments etc.
- Similarly, plantations/forests are avoided to the maximum extent possible. When it is not possible, a route is selected in consultation with the Divisional Secretaries that causes minimum damage to existing plantation/forest resources.
- The MV/LV line route does not infringe with area of natural resources. Alignments are selected to avoid wetlands and unstable areas for both financial and environmental reasons.
- The route of the MV/LV line does not affect any monument of cultural or historical importance.

- Ensure that Polychlorinated Biphenyls (PCBs) are not used in the transformers installed in the project funded facilities.
- In addition, care is also taken to avoid/minimise protected parks/national parks, bird sanctuaries and any other forest area rich in wild life. Proper care shall be taken to avoid areas of high density of trees if the line passes through any forest reserve and appropriate approvals of Department of Forests and Department of Wildlife Conservation, Sri Lanka.

249. In order to achieve this, CEB has undertaken route selection for individual gantry based switching stations/33 kV lines in close consultation with representatives from Divisional Secretaries, Ministry of Land, Agrarian service Department, Department of Survey, Forest Department, and the local community. Although under the national law, CEB has the Right of Way (RoW), yet it considers alternative alignments during site selection, with minor alterations often added to avoid environmentally sensitive areas and settlements at the implementation stage.

250. Keeping above in mind, various alignments of lines were considered taking care of above factors. All such different alternatives were studied by the CEB officials before being proposed to ADB for funding to arrive at most optimum route which can be taken up for detailed survey and assessment of environmental and social impacts for their proper management. **Annexure 2** gives an illustrative evaluation analysis of the alignments of 33 kV line, **Annexure 3A** gives the location analysis for the gantry and **Annexure 3B** Power switching substations (PSS). **Annexure 4** gives the inventorization along the proposed 33 kV lines. **Table 19** gives the summary of the final evaluation of the site selection. **Annexure 9** gives selected photographs from each of the project locations.

SN°	Project Component	Alternative Chosen	Reason
D-1	Old Anuradhapura GSS to Mahailuppallama Gantry		Uses row of 132 kv line and paddy fields, passes minimum forest area, few home gardens
D-2	Gantry at Mahailuppallama	Private Land	No houses nearby, edge of a paddy land close to Kekirawa- Eppawala main road, next to an existing 33 kV pole line
D-3	Ethgala Gantry to Storefield Gantry		Least number of houses, mainly through degraded lands
D-4	Gantry at Ethgala		Degraded land, away from houses
D-5	Kappalthurai GSS to Chinabay Gantry.		Mainly through degraded teak plantation, close to a railway line, no home gardens or houses affected by the line
D-6	Gantry at Chinabay		Degraded teak plantation, no houses, land where 130 oil tanks are located in China Bay
D-7	Augmentation of Ethulkotte PSS	Existing facility	Existing facility next to the main CEB building for Distribution Division 3
D-8	Embilipitiya GSS to Weniwelara		Least no of plantations, through paddy and banana cultivated lands, no houses
D-9	Gantry at Weniwelara	Private Land	Houses 50 m away, private land paddy

Table 19: Summary of final alternative taken for Project Consideration

SN°	Project Component	Alternative Chosen	Reason
			etc.
D-10	New PSS at Rattanapitiya		No houses nearby, uncultivated land next to a main canal
D-11	Augmentation of Beligaha PSS	Existing facility, CEB land	Existing facility, CEB land
D12	Matugama GSS to Bentota PSS		Through paddy fields, degraded lands and oil palm plantation, Best alternative that avoids houses in row

6.2.1 Reasons for the final selection

251. Considering the various reasons based on information in the **Annexures 2, 3A&3B**, and **4**, the alignments selected were found to be most suitable as they involved lesser populated area, plantation/forest areas, and minimum RoW problems. In addition, a minimum disturbance to the reserve forests has been caused as the route of the line shall be utilised which has more degraded forests.

Distance from Sensitive Receptors

252. Distance from various receptors is give in **Table 20** below:

SNo.	Name of Subproj ect	Primary School	Secondary School	Temple	Primary Clinic (PHC)	Main Hospital	Populati on/Inha bitant (in pockets)	Metal access path to the Site
D-1	Old Anuradh apura GSS to Mahailu ppallam a Gantry	KudaNelu mkulama (0.3 km), Yahalegam a, Nachchadu wa Nallamuda wa (0.6 km), Selesthima duwa School (0.37 km), Puliyankula ma (0.2 km)	Anuradhapura (0.8 km) Eppawala Tammannaga ma (0.6 km) Aluthwewa School (0.4 km)	Shylabimba ramaya, Nallamuda wa (0.3 km)	Yahalega ma Selesthim aduwa, Eppawala	Anuradhap ura (2 km)		Yes
D-2	Gantry at Mahailu ppallam a	-	-	-	-	-	-	Yes (Kekirawa- Eppawala road)

Table 20: Approximate distance of Tranche-2 subprojects from sensitive receptors

SNo.	Name of Subproj ect	Primary School	Secondary School	Temple	Primary Clinic (PHC)	Main Hospital	Populati on/Inha bitant (in pockets)	Metal access path to the Site
D-3	Ethgala Gantry to Storefiel d Gantry	Ethgala (1.2 km), Hakwalapa tana, Hopewell colany, Storefield	Gampola (2 km)	150m to Sri Bodirajara maya, Storefield	Ethgala, Hakwalap atana, Jayamala pura	Gampola		Yes
D-4	Gantry at Ethgala	-	-	-	-	-	-	Yes
D-5	Kappalt hurai GSS to Chinaba y Gantry.	Kappalthur ai, Sardhapur a	Trincomalee (5 km)	0.20 km to China Bay temple	Kappalthu rai, Sardhapu ra	Trincomal ee		Yes
D-6	Gantry at Chinaba y	-	-	-0.20 km to China Bay temple	-	-	-	Yes
D-7	Augmen tation of Ethulkot te PSS	Ethulkotte	Sri Jayewardenp ura	Nagavihara ya, Ethulkotte	Ethulkotte	Sri Jayewarde nepura hospital		Yes
D-8	Embilipit iya GSS to Weniwel ara	Thunkama, Karawila yaya, Padalangal a	Karawila Yaya school (0.3 km), Padalangala	Karawila Yaya temple (0.2 km), Weniwelara , Purana Viharaya (0.1 km)	Padalang ala	Embilipitiy a hospital (3.5 km)		Yes
D-9	Gantry at Weniwel ara	Weniwelar a	-	Weniwelara temple (0.5 km)		Embilipitiy a hospital (5.5 km)		Yes
D-10	New PSS at Rattana pitiya	Rattnapitiy a primary school (1.2 km)	Nugegoda (3 schools, c. 3 km)	Pepiyana Sunethra Devi Pirivena (0.8 km)	Nugegod a	Kalubowila Teaching hospital (3 km)		Yes
D-11	Augmen tation of Beligah a PSS	Beligaha	Galle (6 km)	-	Galle	Galle General hospital (6 km)		Yes

SNo.	Name of Subproj ect	Primary School	Secondary School	Temple	Primary Clinic (PHC)	Main Hospital	Populati on/Inha bitant (in pockets)	Metal access path to the Site
D12	Matuga ma GSS to Bentota PSS	Matugama, Yatadola, Kaalawila, Dargatown	Matugama Dargatown Bentota	Vivekarama ya, Yatadola near AP 2 (300 m), Seelavisud daramaya near AP 6 (0.4 km) Sambodara maya, near AP 11, Kaalawila Temple near AP 17, Sri Sudarmara maya near AP 22, Galapatha Rajamaha Viharaya 450 m	Matugam a	Kalutara, Nagoda		Yes

253. No land acquisition nor resettlement requirements will be required for distribution lines. Acquisition of land will not be required from the surrounding communities for an approximate 250-300 sq.m. plot of land required for gantry based switching stations for Gantries land as all are mainly based on government land.

254. Total land requirement for the component is given in **Table 21** below:

Table 21: Total land required for Tranche 2 subprojects

No	Name of Subproject	Total Land Area in Ha	Private Land in Ha	Government/Forest land in Ha
D-1	Old Anuradhapura GSS to Mahailuppallama Gantry	1.92 for angle tower bases, 2.8 ha for suspension tower bases	1.92 and 2.8	-
D-2	Gantry at Mahailuppallama	0.03	0.03	-
D-3	Ethgala Gantry to Storefield Gantry	0.88 for tower bases	0.88	-
D-4	Gantry at Ethgala	0.03	0.03	-
D-5	Kappalthurai GSS to	1.84 for tower bases	1.84	-

No	Name of Subproject	Total Land Area in Ha	Private Land in Ha	Government/Forest land in Ha
	Chinabay Gantry.			
D-6	Gantry at Chinabay	0.05	-	0.05
D-7	Augmentation of Ethulkotte PSS	0.10	-	0.10 (CEB)
D-8	Embilipitiya GSS to	1.8 ha for tower	1.8	-
	Weniwelara	bases		
D-9	Gantry at Weniwelara	0.03	0.03	-
D-	New PSS at Rattanapitiya	0.1	-	0.1
10				
D-	Augmentation of Beligaha	0.1	-	0.1(CEB)
11	PSS			
D12	Matugama GSS to Bentota	1.98 ha for tower	1.98	-
	PSS	bases		

255. No declared wildlife sanctuary and national parks are located near the project affected area. These line routes have been demarcated avoiding all populated areas, and any possible ecological areas. **Table 22** gives the details.

No	Name of Sub-project	Nearest Aerial Distance	Protected Area	IUCN Category
D-1	Old Anuradhapura GSS to		None	
	Mahailuppallama Gantry			
D-2	Gantry at Mahailuppallama		None	
D-3	Ethgala Gantry to Storefield Gantry		None	
D-4	Gantry at Ethgala		None	
D-5	Kappalthurai GSS to Chinabay	0.5 km	Naval Headworks	Less than
	Gantry.		Sanctuary	IV
D-6	Gantry at Chinabay	2.5 km	Naval Headworks	Less than
			Sanctuary	IV
D-7	Augmentation of Ethulkotte PSS		None	
D-8	Embilipitiya GSS to Weniwelara		None	
D-9	Gantry at Weniwelara		None	
D-	New PSS at Rattanapitiya	1.9 km	Bellanwila Bird	Less than
10			Sanctuary	IV
D-	Augmentation of Beligaha PSS		None	
11	-			
D12	Matugama GSS to Bentota PSS	1.2 km	Dedduwa	Less than
			Sanctuary	IV

Table 22: Distance from WLS and National Parks for the Component

7.0 INFORMATION DISCLOSURE, CONSULTATION, AND PARTICIPATION

256. In line with National Environmental Act (2002) in Sri Lanka, public consultation and information disclosure will be undertaken through public notice prior to the approval by CEA for the particular project. According to ADB SPS 2009, public consultation and information disclosure is to be made during the initial stages by the client itself. This activity supports the view to understand the public's perception of the project and respond to their concerns and suggestions during the early stages of the project design. Incorporation on the environmental concerns to the decision making process through the public consultation will avoid or minimise conflict situation during the implementation process.

257. Public consultations were conducted in project-affected area between March – May 2016. The community aired their opinions freely on the project, its impact, and suggestions for mitigating adverse impacts. People participated in voluntary public consultation sessions to express their views about the proposed project. **Table 23** indicates a summary of public consultations conducted during the field survey. The transcript of these discussions will help CEB and the EPC contractor conduct a proper needs assessment to ensure the issues raised by people are addressed appropriately.

SN°	Name of the Component /Site	Name of the Village, Gramasevaka Division, District, Province	Names of the Participants
D-1	Old Anuradhapura GSS to Mahailuppalla ma Gantry	Athuruwalla; ii) Nallamudawa; iii) Thammannapura; iv) Ihalagama Madawala Gama 273; ii) 376 Nallamudawa; iii) 241 Thammannapura; iv) 382 Ihalagama DS Division: i) Nachchaduwa; ii) Thalawa; iii) Anuradhapura	Ms. H.B. Ukku Amma, Ms. W.M. Karunawathi, M.B. Sarath Gamini Wanasinghe, Ms. W.M. Nirosha Nilmini, K.M.A. Bandara, Ms. R. Nadeera Ms. R. Nirosha, Ms. A.A. Sabeetha, Ms. H.B. Gnanawathi, Ms. H.M. Chandrakanthi, R.G. Ariyawansha, S. Edirisinghe, Ms. M. Sumedha Wasanthi, Jayarathna, Nazeer, W M C. Weerasekara, Ms. C.
D-2	Gantry at Mahailuppalla ma		Kalyani, Ms. Sumanawathi S.N. Herath, Ms. S. Seethwathi, Ms. Nayani Maheshika, Ms. S.W.K. Priyanthi, K. Jayarathna Ms. S. Surekha, N. Piyatissa
D-3 D-4	Ethgala Gantry to Storefield Gantry Gantry at Ethgala	Village/s: i) Ethgalagama ii) Owarell Watta Name of the GND: i) Gampalawela 1077 ii) Nawadewita 1167 Name of the DS Division: i) Ganga Ihala Korale ii) Uda palatha Gampola	H.M. Francis, L.R. Samarasingha, N. Samarasingha, Pradeep Nissanka, M.G. Darmasena, Ms. W.G. Hemakanthi Janaka, Ms. Sriyani Anusha Darmasena Upul Nishantha

Table 23: Public Consultations

SN°	Name of the Component /Site	Name of the Village, Gramasevaka Division, District, Province	Names of the Participants
D-5 D-6	Kappalthurai GSS to Chinabay Gantry. Gantry at Chinabay		M.R. Jawazir, A.L. Nasuruiia, Ms. J. Risana, M.L.M. Khalid, Zulfika, Ms. Shiyama, Ms. Rifnas P.M. Akbar
D-7	Augmentation of Ethulkotte PSS		None
D-8 D-9	Embilipitiya GSS to Weniwelara Gantry at Weniwelara	Name of the village/s: (i) Thunkama; (ii) Upper Weniwal Ara Name of the GND: (i) Thunkama 216; (ii) Weniwal Ara 108 Name of the DS Division: (i) Embilipitiya; (ii) Sooriyawewa	A.M.S.M. Hemantha Bandara, Ms. S.M. Podi Menike, Ms. L.W. Chandrani, Ms. M. Suchitra Ms. K. Lalitha Padmini, K.A. Upul, Ms. B. Nirosha Sandamali, P. Amarathunga, Ms. Ramani Jayasinghe, D.J. Pathirana, W.A.K. Nihal Ms. U.A. Subadra, D. Edwrin, W. Nilantha V.G. Piyadasa, V.G. Ajith Sanjeewa, Ms. Vithanage Kusumawathi
D-10	New PSS at Rattanapitiya	Pepiliyana	None
D-11	Augmentation of Beligaha PSS		None
D12	Matugama GSS to Bentota PSS		Ananda Senanayaka, K.V. Chandralatha, Rathnawali Weraniyagoda, Asith Priyantha, Samantha Kumarasinghe, Ms. A. Nilmini Deepani, I.K. Gunatilake, Ms.H.K. Chandrawathi, Ms. Premawathi Gunatilake, Ms. I. Thushari , K.A.Lasantha Kumarasiri, N.T. Dikkumbura, Ms.T. Wimalawathi, Ms. T. Samadi, G.K.G. Senavirathna,W. Shelton Rajarathna

7.1 Consultation Findings

D-1. - Old Anuradhapura GSS to Mahailuppallama Gantry

D-2. - Gantry at Mahailuppallama

258. Would have no objection if the line does not affect our day to day lives. We are concerned of the fate of our crops such as banana and coconut. We would like our trees to be saved. If the line does not traverse over our houses then we will have no problem about living

here. It would be better if this line can go in parallel to the already existing lines towards Mahailuppallama. The already existing lines brought us no trouble at all **(Athuruwalla).** Would not object if the lines don't traverse over our houses and across our lands. Towers should not be placed near houses because children might try to climb on them. They fear the lightening **(Nallamudawa).** Heavily raise objection regarding the project. Some lands are already affected with 4-5 lines traversing over them. If another line is added there will be no space to live. The transformers and equipment catch fire at times. Twice the wires fell on the ground. We live in fear of our lives. We can't even watch TV peacefully. At times of lightening, we are very much afraid. No trees can be planted in these lands and no two storied houses can be built. The lines can traverse over the land closer to the Nuwara Wewa sanctuary (**Tammannapura).** Two years earlier, the CEB came and measured the area for a line. If this line takes that exact route then there will be no problems. We feel afraid as we are not aware of the hazards that accompany such lines. There are no tall trees but there is livestock rearing in the area. Hope that the towers would pose no threat to the livestock rearing. We have no objection if the lines traverse over the forest **(Ihalagama).**

259. Drinking water is provided by the Thuruwila Water Project. The water meters charge for the amount of units consumed. Used to have wells but they are no longer used (Athuruwalla). Out of the 4 wells in the village only 2 have water suitable for drinking. Those wells are ½ km away. Some buy water. 1 liter is SLR 4 and 30 liters are SLR 100. Water is not provided by the Water Supply Board (Nallamudawa). The well water is saline. The water from the National Water Board is used mainly for businesses. A majority buy the water needed for drinking either from shops or from the water truck (Tammannapura). The village has no source of drinking water. Water is bought for SLR 3 a liter (Ihalagama).

D-3. - Ethgala Gantry to Storefield Gantry

D-4. - Gantry at Ethgala

We have already lost a part of our land to the upcoming Moragolla power station. But, 260. we still have not received the promised cash compensation. If this line comes, we will lose the rest of our land. Thus we highly object to this project. We farm in green houses and these projects affect our farming. There is a risk of lightening. The value of the lands will decrease. If the line is moved 50m towards the river then we will not object because then our land is secured (Ethgalagama). There is already a line traversing over this land. We are unable to grow any tall trees. The CEB comes and cuts them down. Our children will not be able to build storied houses. We live in fear of the lines falling on to our houses. We highly object to this project (Owarell Watta). No government land. All are privately owned. Most of the people own 20-40 perches of land. Around 10-15 families own 4-5 acres of land. Around 10 families own 1-2 acres of land. Coconut, cloves, jak are planted in these lands (Ethgalagama). This is private land. In 1971, ¹/₂ acre plots of land were distributed to people. Now most of the people own 30 perches of land. Some lands have deeds or permits while some have none (Owarell Watta). 90% of the people receive water from the National Water Supply Board. The others use private wells or spring water (**Ethgalagama**). People use water from the community water supply project, wells or springs (Owarell Watta).

D-5. - Kappalthurai GSS to Chinabay Gantry.

D-6. - Gantry at Chinabay

261. If the line traverses near the railroad, it would be easy because there are no houses

nearby. Make sure of our safety. We have no objection to the lines traversing over our land because we have no tall crops planted. We did not permanently settle in this land during the war time. Tamils stayed behind but the Muslims went to Kinniya when the war became unbearable and moved back after the war. Therefore we did not have permanent plantations. The coconut trees that we have planted are still young and are subject to threats from wild elephants (**Kappalthurei**). This village faced many hardships during the war. It has around 650 families. 4-5 Sinhala families live near the main road. There are around 100 Muslim families and 450 Tamil families. There are Tamil Christians as well as Tamil Hindus. Public places include post office, library, Cooperative store, Sarasvati Tamil Vidyalaya, Kappalthurei hospital, air force camp, mosque and the kovils. The village has no special factories. The main road is 1 ½ km away and Trincomalee is 6 km away (**Kappalthurei**). The National Water Supply board provides the water connections to individual households, which is used for drinking purposes. The water in the wells is used for washing, bathing and irrigation of farmlands (**Kappalthurei**).

D-7. - Augmentation of Ethulkotte PSS

262. None, as it is existing CEB substation, there is no additional impact outside the boundary.

D-8. - Embilipitiya GSS to Weniwelara

D-9. - Gantry at Weniwelara

263. As we are across the road, we have no problem. But the people on the other side of the road will get impacted. Would not mind cutting trees for the sake of country's development. We are highly against the idea if the steel poles would be erected in the middle of our land. Then the lands become useless. Have the lines along the road as they have done previously without damaging the land. Cutting the trees would increase the temperature and increase the risk of getting struck by lightening **(Thunkama).** Would not mind if it does not generate much noise because if not the tranquility of the surroundings would be destroyed. If the lines go over the paddy fields then it is fine. But, if the lines go over the banana fields then they should not damage the banana trees. As we have been reassured that there is no risk of getting struck by lightening, we have no major objection to the project **(Upper Weniwalara).**

264. All the lands are given by government with the deeds. Some have purchased the land and have made separate deeds for them but the banks don't accept them. The purchased land range from 20-40 perches. Some of the YSS families still have the original 3/4 acre highland and 2 ³/₄ acre paddy lands. Some have built houses on the paddy land **(Thunkama).** All the land in the village was given in the 1970's under the Mahaveli project. There are no private land permits. But some have made their own deeds for the ¹/₄ acre of highland **(Upper Weniwalara).**

265. Drinking water is provided by the National Water Supply & Drainage Board and from the Suwadiwi community water project. The number of wells is less because they run out water during drought **(Thunkama).** Drinking water is supplied to the village by the Weniwal Ara community water project which charges SLR.20 per unit. That water is unclean. But we drink them because we don't have any other option **(Upper Weniwal Ara).** There are a few cases of asthma maybe due to the dust.

D-10. - New PSS at Rattanapitiya

266. Consulation could not be done in the area.

D-11. - Augmentation of Beligaha PSS

267. None, as it is existing CEB substation, there is no additional impact outside the boundary.

D12. - Matugama GSS to Bentota PSS

268. We highly object to the line traversing over our land. Our land has many coconut trees. They are highly valuable. This project will be a threat to our security, we will lose our coconut trees and we will not be able build two storied houses. Compensation is only temporary. These are our ancestral lands and we will never bear to lose them. These lands are not barren lands for us to sacrifice. These are highly useful and money generating pieces of land. If needed we will get together and protest against this project (Kadigamugoda). If lines traverse over the already proposed land, we will have no objection because those lands have no useful crops. Next to that is the lake and next to the lake is a jointly owned land. It would be better if the line can traverse over that (Bodhimaluwa). We won't object as this is a development project. But we fear about our security. We have heard that the lines increase lightening. And what if a tower or a line falls on the ground. Then our whole area will be destroyed. This area has no worthwhile crops but right ahead are coconut fields. We will not object if our trees are spared and the lines traverse over the marshes instead of our houses (Kaalawila). All lands are private. There is no government land. Most of the families own 1/4 to 1/2 acre of land. 10-15 families own 1, 1 1/2, 2 acres of land. Coconut is the main crop cultivated in all lands (Kadigamugoda). No government land. All are privately owned. These lands are flooded every 2 years from the Benthara River, which is 200m away. Many own ¼ and ½ acres of land. 20% have 20, 30 perches of land. Around 10 own 1, 1 ¹/₂, 2, 3 acres of land. Coconut is mainly grown in these lands. Some own ¹/₄ to ½ acres of coconut fields (Bodhimaluwa). There are both government and private land. The government land has been distributed in the 1980's. Some of the owners now have permits or deeds. Paddy farming is difficult in these lands because of the flooding. A family owns ¼ or ½ acre of land (Kaalawila).

269. 80% of the households get drinking water supplied by the National Water Supply Board. The others collect water from families who are connected to water supply line. Some wells have good water. But most water is saline (**Kadigamugoda; Bodhimaluwa).** Water from the wells located on the land across the marshes is good. People use that water for drinking. The water provided by the National Water Supply Board is salty (**Kaalawila**).

8.0 GRIEVANCE REDRESS MECHANISM

8.1 Awareness of Stakeholders

270. During Public consultation sessions of the IEE study, discussions with groups and individuals were conducted to make them aware of the proposed project. Thus, the project-affected community residing beside the proposed distribution line has gained a reasonable knowledge about the potential grievances, which will arise in the future.

271. A community awareness programme must be conducted one month prior to construction by the Project Implementation Unit (PIU) of CEB regarding the scope of the project, procedure of construction activities, utility of resources, identified impacts and mitigation measures. These awareness programmes will help the community to resolve problems and clarify their distrusts related to the proposed project at initial stage.

272. The community should be informed about the Grievance Redress Mechanism (GRM), procedure for making complaints, including the place and the responsible person to contact is already established by the Public Utilities Commission of Sri Lanka (PUCSL). Almost all the stakeholders related to the GRM must be made aware of the established grievance process, the requirement of grievance mechanism, goals, benefits, relevant laws regulations etc. PUCSL Act lays down procedures for Grievance Redressal for lines as attached in **Annexure 8** (Granting of Necessary Wayleaves for Electricity Networks in Sri Lanka - Guidelines for Licensees, Divisional Secretaries and Landowners and/or Occupiers.).

8.2 Grievance Redress Mechanism and PUCSL

273. The Grievance Redress Mechanism (GRM) for the infrastructure development project provides an effective approach for complaints and resolution of issues made by the affected community in a reliable way. This mechanism will remain active throughout the life cycle of the project. Thus, Public Utilities Commission of Sri Lanka (PUCSL) Act creates an environment for all inhabitants of Sri Lanka and the contributors to its development, to have access to essential infrastructure and utility services in the most economical manner within the boundaries of the sustainable development agenda of the country. PUCSL's mission is to regulate all the utilities within its purview, to ensure safe, reliable and reasonably priced infrastructure services for existing as well as future consumers in the most equitable and sustainable manner. **Figure 22** depicts the PUCSL hierarchy.

274. All the members in PUCSL need to be informed by the PIU regarding procedures of GRM. The information should include procedures of taking/ recording complaints, handling of on-the-spot resolution of minor problems, taking care of complainants and provisions of responses to distressed stakeholders etc. PUCSL has a standard mechanism of (i) informing the affected people GRM and its functions, (ii) how peoples representatives in the GRC will be selected, (iii) procedure and the mechanisms adopted for making the complaints, (iv) supporting the complainants in communicating their grievance and attending the GRM meetings and (v) implementing compliance to a GRMs' decision, its monitoring and communication to the people. Periodic meetings of PUCSL are to be conducted by the PIU so that all the members of the PUCSL are familiar with the problems and responses received by individuals in the PUCSL.

275. CEB does not have any specific Environment or Social Safeguards Policy regarding generation/transmission/distribution subprojects currently. ADB procedures require CEB to establish a Grievance Redress Mechanism (GRM) having suitable grievance redress procedure

to receive and facilitate resolution of affected peoples' concerns, complaints, and grievances about the subproject's environmental performance. The GRM will aim to provide a time-bound and transparent mechanism to voice and resolve social and environmental concerns linked to the project. A common GRM will be in place for social, environmental or any other grievances related to the project. The GRM will provide an accessible and trusted platform for receiving and facilitating resolution of affected persons' grievances related to the project. The GRM procedure for the project is outlined below, which follows a time-bound schedule, with responsible persons identified to address grievances and seek appropriate persons' advice at each stage, as required.



Figure 22: Responsibility Hierarchy of PUCSL

276. The grievance mechanism will be scaled to the risks and adverse impacts on environment due the subproject type, size, type of area (sensitive area) and impacts. It should address affected people's concerns and complaints promptly, using a transparent process that

is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people at no costs and without retribution. This GRM would consist of a Grievance Redress Committee (GRC) headed by the Project Head. The committee would consist of the following constitution as listed in **Table 24**.

Table 24: Constitution of Grievance Redress Committee

1 Project Head, CEB

6

- 2 Division Secretary or their nominee
- 3 Representative of Gram Niladhari/Council
- 4 Women representative of village/council
- 5 Representative of EPC* contractor

Distribution Counterpart Team member or nominee

* (EPC) - Engineering, Procurement and Construction Contractor

277. This Grievance Redress Mechanism (GRM) will provide an effective approach for resolution of complaints and issues of the affected person/community. Project Management Unit (PMU) shall formulate procedures for implementing the GRM, while the PIUs shall undertake GRM's initiatives that include procedures of taking/recording complaints, handling of on-the-spot resolution of minor problems, taking care of complainants and provisions of responses to distressed stakeholders etc. paying particular attention to the impacts on vulnerable groups.

278. Grievances of affected persons (APs) will first be brought to the attention of the Project head of the PIU. Grievances not redressed by the PIU will be brought to the Grievance Redress Committee (GRC) set up to monitor subproject Implementation for each subproject affected area. The GRC will determine the merit of each grievance, and resolve grievances within an outer time limit of three months of receiving the complaint. The proposed mechanism does not impede access to the country's judicial or administrative remedies. The AP has the right to refer the grievances to an appropriate courts of law/PUCSL if not satisfied with the redress at any stage of the process.

279. The PIU will keep records of all grievances received including: contact details of complainant, date that the complaint was received, nature of grievance, agreed corrective actions and the date these were effected, and final outcome. The flow chart showing Grievance Redress Mechanism is presented in **Figure 23**.



Figure: 23: Flow chart showing Grievance Redress Mechanism

(*) Affected Persons can approach the court of law/PUCSL at time during the Grievance redress process.

9.0 ENVIRONMENT MANAGEMENT PLAN

9.1 Environmental Management Plan

280. The environmental management plan (EMP) has been prepared for the sub-project that discusses the anticipated impacts, monitoring requirements, and development of mitigation measures with respect to the following stages: (i) pre-construction, (ii) construction, and (iii) operation and maintenance. Detailed, site-specific mitigation measures and monitoring plans were developed and will be implemented during the project implementation phase.

281. The Environmental Management Plan (EMP) for the project is attached as **Annexure 5**, which identifies feasible and cost effective measures to be taken to reduce potential significant, adverse, impacts to acceptable levels. Here, proper mitigation measures are proposed for each potential impact, including details on responsible parties for implementation of mitigation measures and supervision.

282. A summary environmental impact matrix and the mitigation measures are given in **Table 25** below.

SI	SI Magnitude of				of				
N	Environmenta	Potential	Nature	of	Impa	cts	•	Mitigation	Implementatio
0	I Attribute	Impacts	Impact	-	Lo	Mediu	Hig	Measures	n & Monitoring
		-	-		w	m	h		-
Α.	Physical Resou	irces							
1.	Climate	Change in the surface features and present aesthetics due to the construction of the project.	Direct/Local/ irreversible	/	x	x		The surface soil will be restored to normal slope after tower erection. If there is any excess soil, it shall be disposed of at suitable location. Any loss of vegetation will be attended by CEB as per existing GoSL norms	The surface soil will be restored to normal slope after tower erection. If there is any excess soil, it shall be disposed of at suitable location. Any loss of vegetation will be attended by CEB as per existing GoSL norms
2.	Climate	No impacts on the climatic conditions	Direct/Local/ irreversible	/	X			No measurable impact on the climatic conditions, hence no mitigation is required	
В.	Environmental	Resources							
1.	Air Quality	Project will have marginal impact on air quality during the construction	Direct/Local/ reversible	/	Х			Water sprinkling at construction site, limited bare soils, maintenance of	During construction phase

Table 25: Environmental Impact Matrix

SI N	Environmenta	Potential	Nature of	Mag Impa	nitude acts	of	Mitigation	Implementatio
0	I Attribute	Impacts	Impact	Lo	Mediu	Hig h	Measures	n & Monitoring
		period due to increase in the dust emission.					vehicles etc.	
2.	Noise	Noise due to general construction activities.	Direct/Local/ reversible	×			Restriction of noise generating activities at night and use of personal protective equipment like ear plugs, mufflers etc.	During construction phase
		Noise arising from humming noise from transformers	Direct/Local/ reversible	X			To maintain a safe distance or provide proper shielding near residential areas	During operational phase
3.	Surface and Ground Water quality	Runoff from the construction site	Direct/Local/ reversible	x			Careful siting of towers and gantry. Include standard provisions for chemicals, oils and fuels during construction to be kept in a bunded area of 110% volume away from the watercourses and for plant refueling away from watercourses etc.	Before and during construction phase
		Domestic wastewater from construction sites	Direct/Local/ reversible	X			During line and gantry construction, domestic wastewater treatment may be done by digging small ditches for waste water and then covering it with top soil once the construction team moves to next location.	During construction and operation phases
4.	Solis and Geology	Soll erosion due to erection	Direct/Local/ reversible				Avoiding sites, which are	During and after the

SI N	Environmenta	Potential	Nature	of	Magr Impa	itude cts	of	Mitigation	Implementatio
0	I Attribute	Impacts	Impact		Lo	Mediu m	Hig h	Measures	n & Monitoring
		and clearing of vegetation in the RoW.						prone to soil erosion. Levelling of construction sites.	construction activity
C.	Ecological Res	ources							
1.	Terrestrial Ecology	Loss of vegetation	Direct/Loca irreversible	al/ ?		x		Location of towers on non- cultivable land area. Selection of few access roads. Compensation for crop and trees (including plantation and home gardens) to villagers. The tree planting for forest land diverted to non-forest and trees felled will be done by the forest department and paid by CEB.	Before the construction phase
2.	Terrestrial Fauna	Disturbance to the local fauna during construction	Direct/Loca reversible	al/	X			Wildlife routes and their habitats have been avoided as far as possible during the route selection. Minimise encroachments , and indirect impacts.	Before and during construction phase
3.	Aquatic Ecology	Runoff water from construction site and labour camps.	Direct/Loca reversible	al/	X			Ensure suitable setback for these temporary sites and ensure proper collection and treatment of wastewater.	During construction and operational phase
3.	Aquatic Ecology	No significant impacts envisaged	Direct/Loca reversible	al/		X		Appropriate setback for all construction and camp sites and proper disposal of wastewater	Before and during construction phase

SI N	Environmenta	Potential	Nature c	of	Magn Impao	itude cts	of	Mitigation	Implementatio
0	I Attribute	Impacts	Impact		Lo	Mediu	Hig	Measures	n & Monitoring
					W			waste to avoid polluting the river and streams. Care to avoid harming the aquatic ecology during construction of tower bases.	
<u>D.</u>	Human Environ	Fires	Direct/Local		V			Lico of	During
	Safety	explosion and other accidents at the route alignment of MV line.	Direct/Local		~			personal protective equipment during construction. By lopping of trees, fire hazards will be avoided during maintenance period. Regular inspection of lines for faults prone to accidents.	construction and operation phase
		Exposure to electromagneti c fields	Direct/Local continuous	/	Х			MV lines do not cause too much EM fields	Before and after the construction phase.
2.	Agriculture	Permanent and temporary loss of agriculture land due to tower erection	Direct/Local reversible	/	X			Avoid prime agriculture land. Assessment of land required and compensation. Construction activity in the field/cultivation area after crop is harvested and there after crop will not be sowed at the site until construction is complete.	Before and during construction phase.
3.	Socio- economics	Beneficial impacts from rural and urban electrification. Job opportunities during construction phase	Direct/region al	n		X		Unskilled labour and indirect benefits. Overall economic growth of the region.	During construction and operational phase

SI				Magnitude of		of		
Ν	Environmenta	Potential	Nature of	Imp	acts		Mitigation	Implementatio
0	I Attribute	Impacts	Impact	Lo w	Mediu m	Hig h	Measures	n & Monitoring
4.	Resettlement	Resettlement of the house falling along the RoW.	Direct/Local/ irreversible	Х			Route alignment is selected in such a way that there is no resettlement issue.	Before the construction phase.
5.	Cultural sites	No archaeological, historical or cultural important sites are affected by the construction of the lines.	Direct/Local/ irreversible	X			No archaeological, historical or cultural important sites are affected, hence no mitigation required	During Design
6.	Traffic and Transportation	Traffic congestion due to movement of construction vehicles	Direct/Local/ reversible	x			Avoid high density traffic areas, proper traffic signs at the construction site, ensuring proper access roads	During construction phase
7.	Solid Waste Generation	Probability of Surface and ground water pollution	indirect/Local/ reversible	x			Minimisation, reuse and recycle whenever possible. Separated wooden and scrap will be collected and disposed of in compliance with applicable regulations and rules.	During construction and operation phase

9.2 Environmental Management Plan Budget Costs

283. The compliance with the EMP has been prepared based upon optimum and reasonable costs that are derived upon minimisation of mitigation measures on a "least-cost" basis. Without such expenditures, the project might generate significant environmental impacts, causing the biophysical environment in the area to deteriorate and indirectly depressing the economies of local communities. The main benefits of the mitigation plan are (i) ensuring that environmental standards are met during design, construction, and operation of the project; (ii) providing offsets to negate project impacts especially ecological impacts.

284. From the total based project cost of USD 20.64 million (excluding IDC and contingencies), USD 0.23 million has been included as the Environmental Mitigation (which includes EMP costs) as shown in **Table 26**. The compliance costs for minimisation of mitigation
measures for the EMP has been arrived based on optimum and "least-cost" basis. Typically, the EMP costs will include:

- i. cost for implementation of environmental mitigation measures,
- ii. cost towards monitoring costs, independent audit costs for the project, and
- iii. cost of compensatory afforestation (if any).

TABLE 26: SUMMARY ESTIMATED COST INCLUDING FOR ENVIRONMENTAL MANAGEMENT PLAN (EMP) IMPLEMENTATION (IN M USD) (1 USD = 140 LKR)

Distribution Project	D1	D2	D3	D4	D5	D6	D7	D8	٦٩	D10	D11	D12	τοται
Breakup - Tranche 2		02	00	04	00	00	07	00	00	DIO		DIZ	MUSD
Base cost	3.29	0.25	0.57	0.25	1.71	0.25	3.57	1.57	0.25	3.36	3.57	2.00	20.64
Land cost	-	0.09	-	0.13	-	0.11	-	-	0.04	1.07	-	-	1.43
Civil works &	Inclusiv	ve in Bas	e Cost										-
erection													
Equipment	Inclusiv	ve in Bas	e Cost										-
Consultancy	N/A												-
Project	0.16	0.05	0.03	0.05	0.06	0.05	0.07	0.08	0.05	0.07	0.07	0.10	0.86
management,													
design &													
supervision													
Capacity	N/A												-
Development													
Spares	Inclusiv	ve in Bas	e Cost										-
Base Cost Total	3.45	0.39	0.60	0.43	1.77	0.41	3.64	1.65	0.34	4.50	3.64	2.10	22.93
Environmental	0.04		0.01		0.02		0.04	0.02		0.04	0.04	0.02	0.23
Mitigation *													
Social and R&R,	0.27	-	0.05	-	0.10	-	-	0.13	-	-	-	0.16	0.71
Compensation cost	0.40	0.05	0.00	0.05	0.00	0.05	0.45	0.00	0.04	0.54	0.45	0.00	0.00
Taxes and duties	0.46	0.05	0.08	0.05	0.23	0.05	0.45	0.22	0.04	0.54	0.45	0.28	2.89
Physical	0.34	0.03	0.06	0.03	0.18	0.03	0.36	0.16	0.03	0.34	0.36	0.21	2.11
	0.00	0.01	0.00	0.04	0.05	0.01	0.07	0.04	0.04	0.00	0.00	0.05	0.47
Fince contingency	0.09	0.01	0.02	0.01	0.05	0.01	0.07	0.04	0.01	0.06	0.08	0.05	0.47
	-	-	-	-	-	-	-	-	-	-	-	-	-
	-	-	-	-	-	-	-	-	-	-	-	-	-
commitment	-	-	-	-	-	-	-	-	-	-	-	-	-
Total	4.64	0.47	0.81	0.51	2.34	0.49	4.57	2.22	0.41	5.48	4.57	2.82	29.34
Total		0.11	0.01	0.01			1.01		0.11	0.10	1.07	2.02	20.01
* Environ	ment m	itiaation	nut as	1% of h		st Cons	ists of s		Enviro	nment	al Moni	toring	
D1 Construct	ion of 23	km of 33	kV D/C		wer Line	from Ol	d Anura	hapura	GSS to	Mahaili	Innallam	a Gantry	/
D2 Construct	ion of 2S	SBB (Sti	ructural)	Gantry a	at Mahail	uppallan	na		200 10	mananc	-panam	Cantry	
D3 Construct	D3 Construction of 4km of 33 kV D/C I vnx Tower Line from Ethogia Gantry to Storefield Gantry												
D4 Construct	D4 Construction of 2SSBB (Structural) Gantry at Ethgala												
D5 Construct	ion of 8ki	m of 33 k	√ 4C Ly	nx Towe	er Line fr	om Kapp	althurai	GSS to	Chinaba	ay Ganti	ry		
D6 Construct	D6 Construction of 2SSBB (Structural) Gantry at Chinabay												

- D7 Augmentation of Ethulkotte PSS
- D8 Construction of 11km of 33 kV D/C Lynx Tower Line from Embilipitiya GSS TO Weniwellara Gantry
- D9 Construction of 2SSBB (Structural) Gantry at Weniwellara
- D10 Construction of New Primary Substation at Raththanapitiya
- D11 Augmentation of Beligaha PSS
- D12 Construction of 14 km of 33 kV D/C Lynx Tower Line from Matugama GSS to Bentota PSS

9.3 Monitoring of Environmental Management Plan (EMP)

285. The mitigation measures suggested require monitoring of environmental parameters both during construction and operational phases of the project. The monitoring of the environmental aspects shall be ensured by the Distribution Counterpart Team (DCT) of CEB. During the construction phase, the contractor should ensure that activities like handling of earth works, disposal of debris, storage of materials, labour camps, putting proper traffic signals is done properly to have minimum impact. This in turn should be monitored by the Project Manager of the individual distribution line/gantry subproject. The PIU will supervise the contractor. Other environmental good practices include sanitary waste management, noise abatement, maintaining hygienic conditions, maintenance of fire and safety equipment.

286. The DCT will ensure that site engineers and contractors adhere and comply with all measures and procedures identified in the EMP. Activities to be monitored include: all planning,

coordination and management activities related to the implementation of safeguard issues; the identification of corrective and preventive actions; records of health and safety matters and training activities; consultations with project affected people (as and when needed, particularly during the implementation); feedback, trouble shooting and project related grievances; preparation of progress and monitoring reports as required by the ADB; and verifying the projects overall compliance with safeguard measures and its progress towards achieving the intended loan outcomes.

Environmental Parameters to be monitored

287. To ensure that project would not generate negative impacts to the overall environment quality, monitoring of environmental parameter has to be performed by CEB/Contractor as per contract provisions. The monitoring activities of the project include site supervision, verification of permits, monitoring of water quality, soil, noise and air. Monitoring of the quality of water, soil, air and noise during the construction stage is the responsibility of the contractor by the approved government agency. The measurement of environmental parameters and its periodicity for the Project is summarised in **Annexure 6**.

Reporting

288. Mitigation measures related to construction as specified in the EMP will be incorporated into civil works contracts, and their implementation will be primarily the responsibility of the contractors with the supervision of CEB. In addition, contractors will be required to submit monthly progress reports on the implementation of EMP measures to PIU/PMU. The PMU will report to the ADB on progress achieved against the EMP activities and milestones on a semi-annual basis. Progress reports will include a description of implementable activities and their status; identify the responsible parties involved in their implementation; and provide project management schedules and timeframes for doing so, along with their associated costs. During the operation phase, CEB will submit environmental monitoring report on an annual basis.

289. The DCT after interaction with Project managers of PIUs will prepare and submit environmental monitoring reports to the ADB twice in a year. This report will include the results of environmental monitoring to demonstrate that sound environmental management practices are applied, and the set environmental targets are achieved. The environmental monitoring report will be submitted by the PIU to the PMU. A sample environmental monitoring report format is attached in **Annexure 7**.

290. In case the implementation of EMP measures is not satisfactory, CEB shall ensure proper monitoring by its PIU staff and instruct the EPC contractor to enhance environmental compliance. ADB will continue to monitor project compliance with EMP and loan covenants on an on-going basis throughout the duration of the contract.

9.4 Institutional Arrangements

291. According to the National Environmental Act (NEA), there exists a mandatory requirement to obtain the environmental clearance from the Central Environmental Authority or a Project Approving Agency (PAA) which is authorised under the NEA for any kind of power plants of prescribed capacity and transmission lines over 50 kV in capacity, and above 10 km in length. Therefore, the Ministry of Power and Renewable Energy has established an environment cell in the Planning Division to implement the requirements of NEA. CEB will be the

Executing agency (EA) and the Implementing Agency (IA) for distribution projects (Tranches 2). The Project Management Unit¹⁵ headed by a Deputy General Manager, reports to the General Manager of CEB with appropriate staffing to represent the EA since the time of previous loans.

292. PMU has designated Distribution Counterpart Team (DCT), which has oversight responsibilities for monitoring of all distribution projects in areas such as Environment, R&R and Social safeguards. To assist DCT in these specialist functions, CEB may hire appropriate Environment and Social Consultants at PIU level, as deemed necessary for day-to-day coordination and reporting of project activities.

293. The duties of the DCT will include at a minimum: (i) oversight of field offices and construction contractors for monitoring and implementing mitigation measures; (ii) liaising with the field offices and contractors and seeking their help to solve the environment-related issues of subproject implementation; and (iii) preparation of environmental monitoring reports every 6 months (as required by ADB), which will be uploaded on ADB website. DCT must coordinate with PIUs for monitoring as well as designing appropriate mitigation measures to address environmental and social issues¹⁶.

294. The duties of the DCT at the corporate level:

- Monitoring and implementation of mitigation measures during design, construction and operation phases of the project.
- Coordinate the preparation of suitable environmental management reports at various project sites.
- Advising and coordinating field environmental management cells activity towards effective environment management.
- Advice project planning cell on environmental and social issues to avoid negative environmental impacts.
- Provide training and awareness on environmental and social issues related to power distribution projects to the project staff.

295. The duties of the DCT at the Field level:

- Implement the environment policy guidelines and environmental good practices at the sites.
- Liaise with the forest department and seek help of forest officers in resolving environment monitoring related issues.
- Carry out environmental and social survey in conjunction with project planning cell to avoid negative environmental impact.
- Make the contractor staff aware on environmental and social issues related to power distribution projects so that EMP could be managed effectively.

296. The mitigation measures suggested require monitoring of environmental attributes both during construction and operational phase of the project. The **Figure 24** below depicts the institutional organisation structure showing the various entities within CEB and their role vis-à-vis- other government agencies.

¹⁵ PMU provides Institutional support for financial management and institutional capacity development to all PIUs.

¹⁶ ADB advises that all EAs develop in-house capability for environmental, health, and safety (EHS) program consistent with international best practices. The EHS program should include accounting for environmental benefits resulting from investment projects within three months of loan approval. The monitoring agency shall report on semi-annual basis directly to ADB and determine whether sound environmental management practices have been achieved, and suggest suitable recommendations and remedial measures for midterm correction and improvement.

Figure 24 Institutional Structures and Responsibility for Environmental Management Plan at Ceylon Electricity Board (CEB)



PMU = Project Management Unit, EMP = environmental management plan, MPRE = Ministry of Power and Renewable Energy, PIU = Project Implementation Unit

9.5 Critical Environmental Review Criteria

(i) Loss of irreplaceable resources

297. The rural electrification projects do not involve any large-scale excavation and land lost is insignificant. The EMP includes compensation for the loss by minimising the impact of loss of vegetation as per existing norms under the Forest (Conservation) Act, 2002. There will be no net biodiversity loss in this project due to the afforestation being done by Department of Forests.

(ii) Accelerated use of resources for short-term gains

298. The project will not use any natural resources occurring in the area during construction as well as its operation cum maintenance phases. The construction material such as tower material, cement etc. shall come from factories mostly from abroad, while the excavated soil shall be used for backfilling and revetment to restore the surface. Thus, the project shall not cause any accelerated use of resources for short-term gains.

(iii) Endangering of species

299. Very few endemic species of flora and fauna exist in the project area and adjoining forest areas, but the project activities will not threaten or cause their extinction. This is because all distribution projects are situated in dry zone of Sri Lanka whereas more than 80% of endemic

flora and fauna is normally found in the wet zone. Elephants are present outside Protected Areas in Sri Lanka, however, these areas are not categorized as critical habitats (because elephants are not critically endangered species)¹⁷.

(iv) Promoting undesirable rural-to urban migration

300. The project will not cause any submergence or loss of land holdings that normally trigger migration. It also does not involve acquisition of any private land holdings. Hence, there is no possibility of any migration.

(v) Increase in affluent/poor income gap

301. The distribution project will increase availability and reliability of power. Power is a key input to the economic development of any area. Experience indicates that economic development leads to generation of more jobs, which in turn should raise the living standards of poor. Thus, the project will contribute to reduction of affluent/poor income gap by providing opportunities for employment and rural based economic activities.

¹⁷ According to the National Redlist (2012) elephants are endangered species.

10.0 CONCLUSIONS AND RECOMMENDATIONS

302. Environmental impacts likely to result from the proposed distribution system development are mostly temporary and manageable, and can be managed cost effectively. Careful mitigation and monitoring, specific selection criteria and review/assessment procedures for projects have been specified to ensure that minimal impacts take place. The detailed design would ensure inclusion of any such environmental impacts that could not be specified or identified at this stage, are now taken into account and mitigated where necessary. Those impacts can be reduced through mitigation measures such as correction in work practices at the construction sites, or through the careful selection of sites and access routes. Environment pollution due to cut and fill operations, transportation of construction materials, disposal of debris, nuisance from dust, noise, vehicle fumes, vibration etc. due to construction activities are the short term negative impacts due to proposed project.

303. The proposed construction activities will cause insignificant environment impact and most of the potential environment impacts are temporary in nature mainly restricted to preconstruction and construction periods. The Environment Management Plan (EMP) and the Environment Monitoring Plan (EMoP) have been prepared for the project and responsibilities for implementation assigned. The anticipated environmental impacts can be easily mitigated through implementation of EMP.

304. Proper GRM will be implemented through PUCSL to overcome public inconvenience during the proposed project activities.

305. Distribution projects require land only for gantry based switching stations but do not require land for laying the distribution lines. Wherever possible, the alignment is sited away from major settlements to account for future urban expansion. Forests areas and thick vegetation areas are avoided wherever possible; however, route alignment passes through scrublands, cultivated paddy fields, rubber cultivations, rubber plantations, tea cultivations etc. The lines will also pass through degraded forest areas but avoid any national park or sanctuary. The alignments in this project have also avoided wetlands and geologically unstable areas, which can also pose foundation related problems. Land will only be purchased/acquired for 252 sq meters each for gantry station but no land will be purchased for placing distribution towers on private land thereby avoiding any relocation of project affected people.

306. Benefits far outweigh negative impacts - The proposed project will improve operational efficiency and quality of power, reliability of the system and at the same time will reduce losses. Supply of power to the region will boost economic development of the area by strengthening the power distribution infrastructure. The impact matrix depicts that the project will not have significant negative environmental impacts and the project would help in improving the socio-economic conditions of this developing nation.

307. In accordance with the ADB's Safeguard Policy Statement 2009, the overall environment category for Tranche 2 projects is Category 'A", the environmental classification for this component is "Category B" and does not require an EIA.

Annexure 1 System Design Standards Followed by CEB for Setbacks etc.

Voltage definition

Reference to voltage levels are in accordance with the following values.

Extra low voltage	2	normally not exceeding 30 volts.
Low voltage	34	exceeding 30V, but not exceeding 650 to earth or 1kV between phases
High voltage		exceeding 1kV, but not exceeding 33kV
Extra high voltage	2	exceeding 33kV

System design parameters

Electrical design parameters

The following electrical design parameters have been adopted in the new construction standards.

System frequency		50 Hz			1. (*)
High voltage	1.1	<u>11kV</u>	33kV	132kV	220kV
Nominal system voltage /kV		11	33	132	220
Maximum system voltage /kV		12	36	145	245
Lightening impulse withstand voltage	/kV	- 75	170	800	1050
Wet one minute power frequency with	stand voltage /kV	28	70	300	395
Minimum overall creepage distance / r	nm .	254	699	3100	4800
Low voltage					
Nominal system voltage /V	4	00/230			
Maximum system voltage /V	4	40/254			
One minute test voltage /V	2	000			
Impulse withstand voltage /V	6	000			

Physical design parameters

The following physical design parameters have been adopted in the projected area.

Climate - equatorial, intense sun shine, heavy	rain and dust	laden atmosphere.
Annual average air temperature		27°C
Average annual rainfall	÷	2400 mm
Relative humidity	·	72 - 84 %
Average annual Isokeraunic level	-	80 days

Conductor and structure parameters

Conductor sag and tensions will be determined in accordance with the following parameters.

Maximum conductor tension determined at minimum temperature with maximum wind loading.

Maximum conductor sag determined at maximum wind with no wind.

Constant conductor tension occurs at defined normal everyday temperature. This is the assumed average temperature at which conductor sting will occur.

LOADING AND TEMPERATURES

		P	ole lines	To	wer lines
ASSUMED WIND LOADING					
Wind Pressure on Conductors and Earthwires	N/m2	9.0	575	1.39	970
Wind Pressure on Insulators	N/m2	12	865	1.62	1170
Wind Pressure on Lattice Steel Supports	N/m2	1.9	1370	2.25	1640

ASSETT TTA DUE TO THE PROPERTY OF THE PROPERTY			Pole lines	Tower lines
EARTHWIRES	IDUCTORS &		*	
Minimum Temperatura		oC	15	7
Everyday Temperature		oC	32	32
Minimum Temperature		oC	65	75
MINIMUM FACTORS OF SAFETY				
Conductors and Earthwires at Maximum Tension based on Ultimate Strength	Working		25	
Conductors and Earthwires at Everyday still Air Tension, based on Ultimate Stren	Temperature 19th		45	
Anchor Clamps and Mid-span Joints, bas Ultimate Strength of Conductor and Earth	ed on hwire		0.05	
Insulator Strings and Fittings at Maximur Working Tension based on Failing Load	m		3.0	
Straight Line Supports and Foundations under Normal Working Loads			2.0	
Angle, Section and Terminal Supports and Foundations under Normal Working Load	d ds		2.0	
Towers under Broken Wire Loads			2.5	
Foundations under Broken Wire Loads			1.25	
Clearance from ground and structures			1.5	
Overhead line conductors shall have the 6	-			
a) above ground	stowing minin	num clearan	ces:	
	33kV	11kV	Low vol	tago
cross a public road	6.4m	6.1m	5.5m	unge
iny other positions	6.1m	5.2m	5.0m	
if any other place inaccessible to vehicles	4.9m	4.6m	4.6m	
lying guy wires- across any road or street	5.5m			
) from buildings, other structures, and tre	es			
	33kV	11kV	Low vo	ltage
ertical clearance	3.0m	2.7m	2.4	m
onzontal clearance	2.0m	1.5m	1.5	n
Clearances from Railway Lines				
	33kV	11kV	Low yo	Itage
inimum clearances from rail.	7.0m	6.7m	67.	n
			20.7 1	

No pole or support shall be erected nearer than 3.1m on sidings, and 4.0m in all other cases, from the centre of the nearest railway track to the near face of the pole or support. The pole at each side of the crossing span shall be imbedded in concrete with a minimum depth of 300mm below ground level and a minimum radial thickness of 600mm. The span crossing the railway line shall not exceed 50m, and no joints shall be made in the crossing span, nor in the full span on each side. Double crossarms fitted with insulators shall be erected on the poles at each side of the crossing span.

d) Clearances form Other Conductors

Overhead line conductors shall have the following clearances from other conductors:

a) between other overhead conductors

	LV	11kV	33kV
low voltage			
- vertical clearance	0.6m	1.2m	1.5m
 horizontal clearance 	0.3m	1.2m	1.5m
<u>11kV</u>			
- vertical clearance		0.6m	1.2m
- horizontal clearance		0.7m	0.9m
<u>33kV</u>		1.10% C 1.10% C 1	
- vertical clearance			1.0m
 horizontal clearance 			0.9m
NB : lines of a lower voltage shall not be carried	above lines of a his	ther voltage	ST. STAR

b) from telephone lines

33kV	11kV	bare low voltage	low voltage insulated
1.8m	1.8m	1.2m	0.6m
c) phase to	earth clearances		
I) 33kV		0.32n	n
ii) 11kV		0.12n	n

Safety Clearances - In the interests of personnel safety, safe working clearances shall be as follows:

33kV	11kV	bare low voltage (except neutral)
610mm	300mm	150mm

Operators of any mechanical equipment such as diggers, cranes etc., or drivers of vehicles with high loads etc. Shall be required to maintain a minimum safety distance of 3.5m between their plant and any conductor of any live overhead line. In special circumstances where approval is given in writing this could be reduced to the following minimum distances:

33KV	11kV	bare low voltage
2.0m	1.5m	1.0m

Construction of building, structures, scaffolding or similar shall be limited to a safety distance no closer than 4m from any overhead line.

Tower line		220 kV	132 kV
Minimum Clearance from Conductor: To Ground	m	7.01	6.71
Metal Clad or Roofed Buildings, or other Buildings or Structures upon which a man may stand	m	4.65	4.10
To earthed cradle Guard Wires	m	3.96	3.96
To Electric power Line Wires (Line to Earth)	m	4.57	3.66
To be added to the above Clearance to Allow for Conductor Creep (at Mid Span)	m	0.30	0.30
Minimum horizontal spacing between outermost conductor of adjacent power line in still air	m	15.3	15.3
Spacing between P + T Line and cradle guard	m	1.83	1.83
Minimum clearance from live metal to earth metal	m	2.2	1.65

31 3one 6633 👫 ලංකා වැලිබල මණ්ඩලය No : AGM/ 10/1 General ManagerN ELECTRICITY BOARD 13-10-199 140CT 1993 1 Clearing Right of (Way edge on with (Wayleaves Oleanander) FR.) BRANCH.

Addl. G.M. (D & C S) has requested our recommendation regarding the width of clearance for Right of Way purposes for 220 kV lines.

The past practice in the CEB has been to maintain the following _____ clearances on each side of the transmission line :

220 kV - 100 ft. 132 kV - 60 ft.

I recommend the following widths of right of way for long span transmission lines.

Transm	ission Vol	Ltage	Recommended width Right - of - way	of
	kV		м	
	66	G	18	
	132	1	27	
een al	220		35	

In addition to this, when constructing a 220 kV transmission line, the person who executes the work should use his discretion and clear any tree outside the track which could fall on to the transmission line. The values given above have been determined after taking into consideration the height of the transmission tower, maximum sag of the conductor and the minimum electrical clearance to earthed objects. They are same as those given in Indian Standard : 5613 (Part 11/Sec 2) - 1976 (code of Practice for Design, Installation and Maintenance of Overhead Power Lines)

BLAM P. Manager (Planning) Add1. General OCTO Office of the AGM (Pl.) C.E.B., Colombo 2. 06th Oct., 1993. Copy to :- Addl.G.M. (D & C S) -Ref. your letter No. AGM(D&CS) /Tech. dated 08th Sept.1993.

LINE CLEARANCES

Description of Clearance	Minimum ((met	Clearance ers)
	132 kV	220 kV
Minimum ground clearance at any point not over roads	6.7	7.0
Line conductor to road surface	6.7	7.4
Line conductor to high load route surface	7.5	8.5
Line conductors to railway crossings	8.0	8.2
To Cradle guards	4.0	4.0
To road surface where cradle guards can be used (Note 1)	8.8	9.8
Where power lines cross or are in close proximity (Note 2)	2.7	3.7
To any object on which a person may stand including ladders, access platforms etc. (Note 3)	3.6	4.6
To any object to which access is not required and on which a person cannot stand or lean a ladder (Note 3)	1.4	2.4
Support of upper line and any conductor of lower line	15.0	15.0
Survey and sagging error (Note 4)	0.3	0.3
To trees adjacent to line		
(i) Unable to support ladders/ climber	1.4	2.4
(ii) Capable of supporting ladder/ climber	3.6	4.6
(iii) Trees falling towards line with line conductors hanging vertically only	1.4	2.4

Note

- 1. These clearances are possible for situations where sky cradle can be used for conductor erection and maintenance. These clearances allow for the positioning of Sky cradle and erection of temporary scaffoldings under a live circuit.
- 2. Clearances shall be defined in a way that the upper conductor at its maximum temperature and coincides with the lower conductor, which at its minimum temperature and deflected by an angle of 450degrees.

- 3. Clearances shall be defined with the conductor at its specified maximum temperature and deflected by any angle
- up to 450 degrees.4. To account for minor variations in ground topography and foundation installation, the distribution line profile shall be plotted with an additional clearance of 0.3m over those specified in the above table.

Annexure 2 Route Analysis for 33 kV lines

SNo.	Description	D-1 Old Anuradhapura GSS	D-3 Storefield Gantry to Ethgala	D-5 Kappalthurai GSS to Chinabay	D-8 Embilipitiya GSS to Weniwelara	D-12 Matugama GSS to Bentota PSS
		to Mahailuppallama Gantry	Gantry	Gantry		
1.	Length of line	23 km	4 km	5.5 km	11 km	14 km
2.	Canal / River crossings	Cross Malwathu Oya between 6-7, Cross a small Canal between 14-15	Mahaweli River crossing between AP2-AP3	None	Crosses Walawe River between AP 11 and 12	Crosses Benthota River between AP 16- 17
3.	 (i) Forest Area (in Hectare) (ii) Wild life Sanctuary/National Park (in Hectare) (iii) Distance from nearest Wildlife sanctuary/ National Park 	(i) 2.625 (ii) Mihintale Sanctuary (iii) 5.2 km	(i) 1.29 ha (ii) Galaha Forest Reserve (iii) 12.4 km	(i) 6.63 ha (ii) Naval Headworks Sanctuary (iii) 0.7 km	(i) None (ii) UdaWalawa National Park (iii) 17.4 km	(i) None (ii) Deduwa Sanctuary (iii) 1.3 km
4.	Development of Tower site - Number of towers - Land to be acquired for tower base	-Angle Towers 20, Suspension towers 52 -1.92 ha for angle towers (8x8m), 2.8 ha for suspension towers (6x6 m)	Angle Towers-8, Suspension Towers-12 0.77 ha for angle towers (8x8m), 0.11 ha for suspension towers (6x6 m)	2- Terminal towers, 11- Angle Towers, 11- Suspension Towers 1.25 ha for angle towers (8x8m), 0.59 ha for suspension towers (6x6 m)	Angle towers 14, suspension towers 30 0.09 ha for angle towers (8x8), 0.108 for suspension towers (6x6)	Angel towers 29, suspension towers 27 0.19 ha for angel towers (8x8 m) and 0.01 for suspension towers (6x6 m)
5.	Land Strata	Home gardens, Paddy fields, Scrublands, Dry mixed evergreen forests, Tanks, Tank grounds, Canals	Home gardens, Scrublands, Tea plantations	Home gardens, teak plantations, dry mixed evergreen forest (degraded)	Home gardens, paddy fields, scrublands, banana plantations, vegetable cultivated area, river,	Home gardens, paddy fields, Rubber plantations, Oil palm plantations, mangrove vegetation, marshlands
6.	Road accessibility	1,2,3 points by A13 road, 11point by Srawasthipura road, 15,16 points by Thirappane – Eppawala road, 20 point by B263 road	TT1, AP2 by A5 road AP6, AP7,TT2 by bungalow road AP3-AP4 by Kotmale dam road A5 road cross between TT1, AP2 Kotmale dam road	AP1 and AP6 by A6 road AP11 and TT2 by A15 road parallel to the railway line from Ap2-AP5, about 20 m to the railway line at	Embiliptiya- Nonagama road AP7-8, Padalangala- Sooriyawewa road	Kalutara- Agalawatte road, Colombo- Galle Expressway, Aluthgama- Matugama road, Galle road

SNo.	Description	D-1 Old Anuradhapura GSS to Mahailuppallama Cantry	D-3 Storefield Gantry to Ethgala Gantry	D-5 Kappalthurai GSS to Chinabay Gantry	D-8 Embilipitiya GSS to Weniwelara	D-12 Matugama GSS to Bentota PSS
		Gantry	between AP3-AP4	minimum distance Two gravel roads from the main road A6 to Sardhapura		
7.	Private land (in ha.) (i) Agriculture: - a) Irrigated b) Non-irrigated (ii) Non-Agriculture / Private Waste land. (iii) House or Building: a) Residential b) Non-Residential	(i)Paddy fields 17.15 ha a) Home gardens 6.65 ha	a) home gardens 3.22 ha	(I) Paddy fields 0.86 ha Home gardens 0.6 ha	(i)12.0 ha home gardens 3 ha	(i) 15 ha (ii) 6 ha home gardens
8.	EHV Line Crossing	No	No	No	No	No
9.	HT line crossings	Yes, Between angle point 1 -2, 6 -7	Yes, 132 kV line cross between AP4-AP5, AP7- gantry 33 kV line cross between AP2-AP3, AP7-gantry	No	Yes	Yes
10.	No. of Forest Trees:- a) Trees to be felled b) Trees to be lopped	103	None	490	18	None
11.	No. of private trees (i) Fruit Trees:	34	(i) 5	(i) None	114	245
	a) Trees to be felled b) Trees to be lopped (ii) Non-Fruit Trees:	129	(ii) 92	(iii) 63	96	370

SNo.	Description	D-1 Old Anuradhapura GSS to Mahailuppallama Gantry	D-3 Storefield Gantry to Ethgala Gantry	D-5 Kappalthurai GSS to Chinabay Gantry	D-8 Embilipitiya GSS to Weniwelara	D-12 Matugama GSS to Bentota PSS
	a) Trees to be felled b) Trees to be lopped					
12.	Length of line in mountainous area	None	None	None	None	None
13.	Length of line in coastal area	None	None	0.40 km	None	None
14.	Length of line in cultivated area	11.43 km	2.15	0.88	9 km	10 km
15.	Length of line in un-cultivated area	5.87 km	0.86 km	4.42 km	0.4 ha	4 km
16.	Highest altitude en-route the line	133 m	630 m, AP2	31 m between AP 9 and AP 10	84 m	31 m
17.	Nearest distance from airport	2.23 km to A'Pura airport	76.36 km to Katunayaka Air port	0.5 km to China Bay 0.76 km to Trincomalee airport	18.5 km to Mattala airport	47.8 km to Ratmalana airport
18.	Distance from nearest religious or archaeological sites	400m to Punyabumi Aranya Senasanaya between point 8-9	150m to Sri Bodirajaramaya Storefield from Storefield gantry	6. km to China Bay temple The line travers the teak plantation/ dry- mixed forest area in Chinabay where 130 oil tanks are located. These were built by the British in 1930s. The distance from the 33 kV line to the nearest oil tank is about 58 m.	150 m to Karawila yaya temple Weniwelara temple	Galapatha Rajamaha Viharaya 3. 2 km
19.	Name of villages involved/Name of District	Kuda Nelumkulama, Kirikkulama, Yahalegama, Nachchaduwa, Haturuella, Wettikulama, Nallamudawa,	Storefield, Orwell colony, Hakwalapathana, Jayamalpura, Udagama,Ethgala	Kappalthurai, Sardhapura, China Bay- Trincomalee district, Eastern Province	Thunkama, Karawila yaya, Hagala, Urupelessa, Padalangala, Hathagala, Weniwelara	Matugama, Aluthgamgoda, Keeraththidiya, Kaalawila, Darga Town, Polduwa, Benthota

SNo.	Description	D-1 Old Anuradhapura GSS to Mahailuppallama Gantry	D-3 Storefield Gantry to Ethgala Gantry	D-5 Kappalthurai GSS to Chinabay Gantry	D-8 Embilipitiya GSS to Weniwelara	D-12 Matugama GSS to Bentota PSS
		Galnawa, Thammannagama, Ihalagama, Puliyankulama, Mabailuppalama				
20.	Land to be permanently acquired: a) Area (in ha) b) Cost.	Only for the Mahailuppallama gantry 0.03 ha	Only for the Ethgala gantry 0.03 ha	Only for the ChinaBay gantry 0.03 ha	Only for the Weniwelara gantry 0.03 ha	Not required

S No	Description	D-2 Gantry at	D-4 Gantry at	D-6 Gantry	D-9 Gantry at
		Mahailuppallama	Ethgala	at Chinabay	Weniwelara
1	Land Details	Proposed land	Proposed land	Proposed land	Proposed land
1.1.a	Area of land	0.03 ha	0.03 ha	0.03 ha	0.03 ha
1.b	Slope/Plain Land	Plain land/ paddy	Slope land	Plain land	Plain land/ paddy
1.c	Approximate Amount of land cutting required	None	20%	None	None
2.	Owner Ship of land (Private / Forest/ Other Govt. Department/ Other)	Govt.	Private	Govt.	Private
3.	Private land (in ha.)				
	(i) Agriculture :- a) Irrigated b)Non – irrigated	Agriculture land			Agriculture land
	(ii) Non - Agriculture/ Private Waste land / barren.		Non-agriculture land	Degraded teak plantation	
	(iii) House or Building:c) Residentiald) Non – Residential	Non-Residential	Non-Residential	Non-Residential	Non-Residential
4.	Distance from Nearest (With name)				
4.a	River (Name/Distance)	Nachchaduwa Reservoir 1.2 km	Mahaweli River, line crosses River between AP2-AP3	China Bay Coast, 200 m	Walawe River, line crosses Walawe river
4.b	Highway	Kandy- Jaffna Highway A9, 2.2 km	Kandy- NuwaraEliya highway	Kandy- Trincomalee road, A6	Embiliptiya- Nonagama road, A18
4.c	Forest Area	Kahalla- Pallekele Sanctuary, 18 km	Galaha Forest Reserve 12.3 km	Naval Headworks Sanctuary, 100 m at K'Thurai	Kaparella- Uswewa Forest Reserve, 4.2 km
4.d	Village / town	Keerikulama, Yahalegama, Selesthimaduwa	Ethgala, Storefield	Kappalthurai, Sardhapura	Thunkama, Padalangala
4.e	Market/Area of Economic Activity	Anuradhapura	Gampola	Trincomalee	Embiliptiya
5.	Road accessibility	A9 road, Galkulama- Anuradhapura road	Kandy- Nuwara Eliya road	Kandy- Trincomalee road, A6	Embiliptiya- Nonagama road, A18, Padalangala- Suriyawewa road
6.	EHV Line Passing Near By (Distance)	No	No	No	No
7.	HT line Passing Near By	Yes	Yes	Yes	Yes
8.	No. of Forest Trees:- c)Trees to be felled d) Trees to be lopped	103	None	490	18
9.	No. of private trees				
	(iii) Fruit Trees:c)Trees to be felledd) Trees to be lopped	34	05	None	114
	(iv) Non - Fruit Trees: c)Trees to be felled d) Trees to be lopped	129	92	63	96
10.	Distance from mountainous area	Mihintale 8.7 km	Kothmale 5.5 km		

S No	Description	D-2 Gantry at	D-4 Gantry at	D-6 Gantry	D-9 Gantry at	
		Mahailuppallama	Ethgala	at Chinabay	Weniwelara	
11.	Distance from in cultivated area	Line passes through paddy fields	Line is through tea plantation, home gardens	Paddy lands 2.7 km	Line passes through paddy lands, banana cultivations	
12.	Altitude of Gantry	124 m	593 m	18 m	37 m	
13.	Nearest distance from airport	A'Pura airport 1.5 km	108 km to Katunayake Airport	Trincomalee airport, 792 m	Mattala Airport, 18 km	
14.	Distance from nearest religious or archaeological sites	A'Pura sacred city 6.2 km	Temple of Tooth, Kandy, 16 km	Koneshwaram temple, 6.7 km	Madunagala Arnya, 6.8 km	

Annexure 3B Locational Analysis for Power Switching stations (PSS)

S No	Description	D-7 Augmentation of Ethulkotte PSS	D-10 New PSS at Rattanapitiya	D-11 Augmentation of Beligaha PSS
1	Land Details			
1.a	Area of land	0.1 ha	0.1 ha	0.1 ha
1.b	Slope/Plain land	Plain land	Plain Land	Plain land
1.c	Approximate amount of land cutting required	None	None	none
2.	Ownership of land (private / forest/ Govt. department/ other)	CEB	Govt.	CEB
3.	Private land (in ha.)			
	(i) Agriculture - Irrigated - Non – irrigated	None	Agriculture land	None
	(ii) Non - Agriculture/ Private Waste land			
	(iii) House or Building: -Residential -Non – Residential	Non-Residential	Non-Residential	Noe-Residential
4.				
4.a	River (Name/Distance)	Kelani River, 6.2 km	Weres Ganga, 2.6 km	Gin Ganga, 6.4 km
4.b	Highway	Rajagiriya- Malabe road	Dehiwala- Nugegoda road	Galle- Baddegama road
4.c	Forest Area	None	Bellanwila bird Sanctuary, 2.8 km	None
4.d	Village / town	Ethulkotte	Rattanapitiya	Beligaha
4.e	Market/Area of Economic Activity	Malabe	Nugegoda	Galle
5.	Road accessibility	Rajagiriya- Malabe, Kaduwela road	Pepiliyana- Gamsabah junction road	Galle- Baddegama road
6.	EHV Line Passing Nearby (Distance)	No	No	No
7.	HT line Passing Nearby	No	No	No
8.	No. of Forest Trees :- -Trees to be felled -Trees to be lopped	None	None	None
9.	No. of private trees	None	None	None
	Fruit Trees: -Trees to be felled -Trees to be lopped	None	None	None
	Non - Fruit Trees: -Trees to be felled -Trees to be lopped	None	None	None
10.	Distance from coastal/ mountainous area	6.2 km to the coast	3.7 to the coast	8 km to Rumassala Hill
11.	Distance from in cultivated area	Paddy lands 1.6 km	PSS land surrounded by agricultural lands	1.2 km, paddy lands
12.	Altitude of GSS site	6 m	8 m	18 m
13.	Distance from nearest airport	Ratmalana airport, 8.2 km	Ratmalana airport, 4.5 km	Mattala airport, 120 km

S No	Description	D-7 Augmentation of Ethulkotte PSS	D-10 New PSS at Rattanapitiya	D-11 Augmentation of Beligaha PSS
14.	Distance from nearest religious or archaeological sites	Nagaviharaya, Kotte	Bellanwila Temple, 2.8 km	Unawatuna Dagaba, 4.8 km
	Alternative			

Annexure 4: Inventorisation along the 33 kV Distribution Lines

Angle point No from	Angle point No to	Dista nce betwe en two tower s/angl e points /km	Appro ximat e distan ce of distri butio n line from nearb y Villag e/km	Name of Villages	Name of District	Nos. of towe rs Angl e/Su spe nsio n	Area of towe rs/m 2	Area under the ROW (15 m) /ha	Ownersh ip of land (Private, Govern ment, forest)	Land use/ habitat	Number trees to felled	of be
1	2	0.55	0.02	Kuda Nelumkulama,Ga Ikulama	Anuradapu ra	1/1	100	0.83	Private	Home gardens (line cross A13 road,33 kV line& goes under 132kV line)	Kohomb a Teak	3 4
2	3	0.3	0.12	Keerikkulama	Anuradapur a	1/0	64	0.45	Private	Home gardens (crossed 33 kV line)	Kohomb a	3
3	4	2.83	0.11	Pahala Keerikkulama	Anuradapur a	1/8	352	4.25	Private	Home gardens & Paddy fields (crossed 3kV line & near to Keerikkulama)	Kubuk	3
											a	4
4	5	0.39	0.4	Yahalegama	Anuradapur a	1/0	64	0.59	Private	Teak plantation, Scrubland area	Teak	24
											Kohomb	4
5	6	0.88	0.05	Yahalegama	Anuradapur a	1/2	128	1.32	Private	Srubland, Paddy fields	a Maha Andara	16
											Kohomb a	3
											Palu	2
											Siyabal a	2
6	7	1.87	0.09	Nachchaduwa	Anuradapur a	1/5	244	2.81	Private	Home gardens & Paddy fields (line goes under 132kV line & crossed Malwathu Oya)	Coconut Kohomb	17 6
7	8	1.11	0.1	Haturu Ella 2, Elagara	Anuradapur a	1/3	172	1.67	private	Paddy fields (cross a road)	a Teak	1
8	9	1.87	0.02	Kongaswewa,		1/5	244	2.81	Govern	Forest areas,	Kubuk	6
				Nachchaduwa	Anuradapur a				ment	Scrublands(cross Nachchaduwa divisional hospital, Nachchaduwa Sinhala M.V, Punyabumi Aranya Senasanaya,cross Pahalakongas wewa)	Kohmba Palu	4 3
9	10	0.86	0.55	Ihala Kongaswewa	Anuradapur a	1/2	128	1.29	Private	Paddy fields (unable to access to the point)	Trees	21

D-1. - Old Anuradhapura GSS to Mahailuppallama Gantry

Angle point No from	Angle point No to	Dista nce betwe en two tower s/angl e points /km	Appro ximat e distan ce of distri butio n line from nearb y Villag e/km	Name of Villages	Name of District	Nos. of towe rs Angl e/Su spe nsio n	Area of towe rs/m 2	Area under the ROW (15 m) /ha	Ownersh ip of land (Private, Govern ment, forest)	Land use/ habitat	Number trees to felled	of be	
10	11	0.49	0.07	Wettilulama	Anuradapur a	1/0	64	0.74	Private	Home gardens(line crossed 33 kV line, Srawasthipura road)	Kohomb a	6	
11	10	1 02	0.12	Wootkiulama		1/2	129		Drivoto	Homo gardons 8	Coconut	8 4	
	12	1.02	0.12	Weetkiulaina	Anuradapur a	1/2	120	1.53	Filvate	Wettikulama tank ground area (line	a Andara	4 3	
											cross 33 kV line & near to Selesthimaduwa school)	Ipil Ipil	4
										301001)	Maila	5	
12	13	2.89	0.07	Nallamudawa	Anuradapur a	1/8	352	4.34	Private	Paddy fields, Srublands(crossed 33 kV line & line near	Kubuk	1	
										to Saila Bimbarama Viharaya & Mawatha wewa)	Kohomb a	4	
13	14	1.64	0.06	Nallamudawa	Anuradapur a	1/4	/4 208 Private Paddy fields, Pa 2.46 Scrublands (line goes above	Palu	1				
										Borawewa, Aluthwewa	Kohomb a	1	
										Vidyalaya, Thamman awa 1km, line crossed a small tank)	Other trees	23	
14	15	2.4		Nallamudawa	Anuradapur a	1/7	316	3.60	Private	Paddy fields (line cross a canal)	Trees	25	
15	16	0.99	0.03	Gallewa	Anuradapur a	1/2	128	1.49	Private	Home gardens and Paddy fields (crossed 33 kV line &	Parama ra	3	
										Thirappane- Eppawala road)	Palmair ah	1	
											Palu	2	
				•							Kohomb a	3	
16	17	0.95	0.02	Gallewa	Anuradapur a	1/2	128	1.43			Siyabal a	3	
									Private	Home gardens and	Ehela	1	
										to see the point)	Other	22	
											Nuga	1	
17	18	0.64	0.01	Ihalagama	Anuradapur a	1/1	100	0.96		Home gardens & scrublands	Siyabal a	1	
		<u> </u>							Private		Palu	1	
		Γ	Γ								Milla	2	
18	19	0.41	0.03	Puliyankulama		1/0	64		Private	Scrubland & Banana	Miila	1	
					Anuradapur a			0.62		plantation (point near to Sewwandi Nursery,cross 33 kV	Parama ra Kubuk	4 3	

Angle point No from	Angle point No to	Dista nce betwe en two tower s/angl e points /km	Appro ximat e distan ce of distri butio n line from nearb y Villag e/km	Name of Villages	Name of District	Nos. of towe rs Angl e/Su spe nsio n	Area of towe rs/m 2	Area under the ROW (15 m) /ha	Ownersh ip of land (Private, Govern ment, forest)	Land use/ habitat	Number trees to felled	of be
										line)	Daluk	1
											Nuga	2
19	20	0.44	0.08	Kubuk Anda, Mahailukpallama	Anuradapur a	2/0	64	0.66	Private	Paddy fields & Banana plantations (crosss Yoda ela,	Jak	1
										B263road (18km	Milla	1
										post), 33 kV line)	Kohomb a	1
											Total	266

Angle point No from	Angle point No to	Distanc e between two towers/a ngle points/k m	Approxi mate distance of distribut ion line from nearby Village/k m	Name of Villages	Name of Distri ct	Nos. of towers Angle/Susp ension	Area of towers /m2	Area under the ROW (15 m) /ha	Owners hip of land (Private, Govern ment, forest)	Land use/ habitat	Number trees to felled	of be
TT1	AP2	0.38	0.0	Storefield, Dalpitiya	Kandy	1/0	64	0.57	Private	Home gardens (line goes above houses, Gantry near to Sri Bodirajaramaya Storefield - 150m,crossed A5 road)	Coconu t Mara	2
											Alstonia Other	4
AP2	AP3	0.34	0.0	Orwel Colony	Kandv	1/0	64	0.51	Private	Home gardens, Tea plantations (line crossed 33 kV line)	trees Coconu t	2
=		0.01	010	colony	. tailay	., 0	0.	0.01			Mango	1
											Sapu Alstonia	2 4
											Aricanu t	5
AP3	AP4	0.38	0.0	Hakwalapath ana	Kandy	1/0	64	0.57	Private	Home gardens, Scrubland (line crossed Mahaweli river)	Trees	8
AP4	AP5	0.48	0.02	Hakwalapath ana	Kandy	1/0	64	0.72	Private	Home gardens, Scrubland (line crossed 132kV line)	Kenda	1
											Eucalyp tus	1
											Spatho dia	2
A P 5	AP6	0.58	0.0	Jayamalapur	Kandy	1/1	100	0.87	Private	Home gardens, Scrubland (point 5	Rukatta	5
		0.50	0.0	a	Ranuy	17.1	100	0.07	Tivale		Other	1
				Bungalow							trees	13
AP6	AP7	0.3	0.06	road, Ethgala	Kandy	1/0	64	0.45	Private	Scrubland	Alstonia	2
AP7	TT2 Gantry	0.55	0.0	Udagama, Ethgala	Kandy	2/1	164	0.82	Private	Home gardens (line crossed 33 kV,132kV lines)	Alstonia Mara	22 1
											Other trees	13
											rotal	97

D-3. - Ethgala Gantry to Storefield Gantry

An gle poi nt No fro m	An gle poi nt No to	Distanc e betwee n two towers/ angle points/k m	Approxi mate distanc e of distribu tion line from nearby Village/ km	Name of Village s	Name of District	Nos. of towers Angle/Susp ension	Area of tower s/m2	Are a un der the RO W (15 m) /ha	Ownership of land (Private, Government, forest)	Land use/ habitat	Number trees to felled	of be
TT1	AP 1	0.64	0.13	Kappalt hurai	Trinco malee			0.0	Government/ Sri Lanka Ports Authority	Scrubland (near to A6 road, near to Army camp)	Teak	4
						1/1	100	0.9 6			ba Maila	2 2
AP 1	AP 2	1.63	0.09	Kappalt hurai	Trinco malee	1/ 4	208	24. 4	Private	Home gardens and Scrublands	Palmyra	3
											Kohom ba	1
											Maila Damba	1 1
											Ingini	1
AP 2	AP 3	0.38	0.01	Kappalt hurai	Trinco malee	1/0	64	0.5 7	Private	Scrubland, Paddy fields	Kon Palmyra	1 1
											MahaA ndara	5
AP	AP	0.42	0.06	Kappalt	Trinco	1/0	64	0.6	Private	Scrubland	MahaA	3
3	4			nurai	malee			3			ndara Maila	1
											Damba Ebala	3
											Palmyra	2
											Kon Palu	1
											Kohom ba	4
AP 4	AP 5	0.25	0.01	Kappalt hurai	Trinco malee	1/0	64	0.3 7	Government/ Sri Lanka Ports Authority	Scrubland	Maila	1
											Palmyra	1
											ivianaA ndara	1
	A D			Ohiaa	T			0.4		David	Teak	2
АР 5	АР 6	0.29	0.21	China Bay	n rinco malee	1/0	64	0.4 6	Government	Dry mixed evergreen forest	Forest trees	20
AP	AP	0 57		China	Trinco	4.14	400	0.8	0	Dry mixed	Forest	6
6 AP	7 AP	0.57	0.2	Bay China	malee Trinco	1/1	100	5 14.	Government	evergreen forest Drv mixed	trees Forest	1
7	8	0.93	0.83	Bay	malee	1/ 2	136	5	Government	evergreen forest	trees	26
AP 8	AP 9	0.28	1.5	China Bav	Trinco malee	1/0	64	0.4 5	Government	Dry mixed evergreen forest	Forest trees	4 6
AP	AP			China	Trinco			18.	-	Dry mixed	Forest	1
9	10	1.23	0.72	Bay	malee	1/3	172	4	Government	evergreen forest	trees Teak	68 20
AP 10	AP 11			China	Trinco			0.4		Teak plantation and	Forest	20
	Ľ.,	0.25	0.24	Bay	malee Trinco	1/0	64	5	Government	Forest area	trees Forest	26
аР 11	TT2	0.26	0.12	Bay	malee	2/0	128	0.4 5	Government	Scrubland	trees	23
												53 3

D-5. - Kappalthurai GSS to Chinabay Gantry.

Angle point No. from	Angl e point No. to	Dista nce betw een two tower s/ang le point s/km	Appro ximate distan ce of distrib ution line from nearby Village /km	Name of Villages	Name of District	Nos. of towers Angle/Su spensio n	Area of towers/m 2	Area under the ROW (15 m) /ha	Ownership of land (Private, Government , forest)	Land use/ habitat	Number of t be felled	trees to
1(TT1)	2	0.46	0.01	Embilipiti ya GSS Yavvana Sopakara Viyapara ya (YSS) Thunkam a	Ratnap ura	1/1	100	0.69	Private	Home Gardens, Teak plantation	Coconut, Kohomba, Lunumidell a, Teak	20
2	3	0.48	0.12	Thunkam a	Ratnapu ra	1/1	100	0.72	Private	Abandoned land, Home gardens	Kohomba, Teak Maila, Ipil Ipil	14
3	4	0.30	0.11	Thunkam a	Ratnap ura	1/1	100	0.45	Private	Scrubland, Home gardens	Kohomba, Teak, Ipil Ipil	13
	_				_				-		Maila	1
4	5	0.41	0.4	Karawila Yaya	Ratnapu ra	1/1	100	0.62	Private	Scrubland	Ipil Ipil, Siyambala Kohomba	3 3
5	6	1.09	0.05	Karawila	Ratnapu	1/4	208	1.02	Private	Scrubland,	Ehela,	4
				Yaya	ra Ratnapu ra					Home gardens, Karawila Xaya Temple	Kaju, Maila Kohomba	7
6	7	0.33	0.09	Mangala Thotupol a, Kaarawil a Yaya	Ratnapu ra	1/1	100	0.50	Private	Scrubland, Vegetable garden, Home gardens	Divul, Burutha, Kohomba, Teak, Coconut	25
7	8	0.22	0.1	Hagala, 13 Ela	Ratnapu ra	1/0	64	0.33	private	Scrublands, home gardens	Coconut, Ipil Ipil, Teak, Kohomba, Lunumidell a, Kitul, Puwak, Anadara	19
8	9	0.40	0.02	Padalang ala		1/1	100	0.60	Government	Banana cultivation, home gardens	Puwak, Coconut, Mango, Kon	20
9	10	0.82	0.55	Elakuttig ala, Padalang ala	Ratnap ura	1/3	172	1.23	Private		Coconut	05
10	11	0.30	0.07	Urupeles sa, Padalang ala		1/0	64	0.45	Private	Banana cultivation, home gardens	Coconut, Teak, Del, Puwak, Kitul, Mango	15
11	12	1.7	0.12	Padalang ala	Ratnap ura	1/6	280	2.55	Private	Home gardens, Banana cultivation		

Angle point No. from	Angl e point No. to	Dista nce betw een two tower s/ang le point s/km	Appro ximate distan ce of distrib ution line from nearby Village /km	Name of Villages	Name of District	Nos. of towers Angle/Su spensio n	Area of towers/m 2	Area under the ROW (15 m) /ha	Ownership of land (Private, Government , forest)	Land use/ habitat	Number of t be felled	trees to
12	13	0.75	0.07	Weniwela ra	Ratnapu ra	1/2	136	1.12	Private	Home gardens		
13	14	1.40	0.06	Weniwela ra	Ratnapu ra	1/5	244	1.71	Private	Home gardens, paddy fields		
14	15	0.71		Weniwela ra Hathagal a Road,	Hamban tota	1/2	136	1.06	Private	Line crosses Walawe River, riverine trees on the river bank, home gardens	Kumbuk, Teak, Attikka, Rukattana, Owila, coconut, Kon, Mahogany, Gamsuriya, Mango, Weralu, Kohomba, Embarella, Del	85
15	16	1.2	0.03	Weniwela ra Hathagal a Road,	Hamban tota	1/5	244	1.80	Private	Home gardens, near Hathagala road, paddy fields	Paddy field	
16	17	0.46		Weniwela ra	Hamban tota	1/1	100	0.69	Private	Paddy fields, home gardens	Paddy filed	
		I						1				234

D-12. - Matugama GSS to Bentota PSS

N o.	Kilome tre	Kilome tre To	Distan ce (km)	N ^o of District s and Name s	Nº of villages and names	№ of Towers/ Polls	Are a of tow er m2	Are a und er the RO W m2	Ownershi p of Land (Private, Governm ent, Forest)	Use of Land (Agricultu ral, Plantatio n, barren/fal low)	Name of crops	Types and № of Trees	Nº of Affected Househ olds	Any public propert ies affecte d	Nº of affected IP househ olds (if any)
1	0	1	1	Kaluta ra	Yatadola Mahawatte (Line crosses Southern Expressway)	5	36	15	Private	Agricultur e & home gardens	Paddy Coconu t	Cocon ut 08 Jak 03	-	-	-
2	1	2	1	Kaluta ra	Yatadola Mahawatte	3	36	15	Private	Agricultur e	Paddy	-	-	-	-
3	2	3	1	Kaluta ra	Yatadola Keeranthidiy a	3	36	15	Private	Agricultur e & plantation s	Paddy Rubber	Rubbe r 60	-	-	-
4	3	4	1	Kaluta ra	Keeranthidiy a (Temple road	3	36	15	Private	Plantatio ns	Rubber Oil palm	Rubbe r 120 Palm oil –	-	-	-

N 0.	Kilome tre	Kilome tre To	Distan ce (km)	Nº of District s and Name s	№ of villages and names	№ of Towers/ Polls	Are a of tow er m2	Are a und er the RO W m2	Ownershi p of Land (Private, Governm ent, Forest)	Use of Land (Agricultu ral, Plantatio n, barren/fal low)	Name of crops	Types and Nº of Trees	Nº of Affected Househ olds	Any public propert ies affecte d	Nº of affected IP househ olds (if any)
												120			
5	4	5	1	Kaluta ra	Keeranthidiy a (Pusselamul la)	4	36	15	Private	Agricultur e & Plantatio n	Paddy Rubber Coconu t	Rubbe r 50 Cocon ut 06	-	-	-
6	5	6	1	Kalaut ara	Kaalawila	4	36	15	Private	Agricultur e & Plantatio ns	Paddy Rubber	Rubbe r 20	-	-	-
7	6	7	1	Kaluta ra	Kaalawila (Brief garden road)	3	36	15	Private	Agricultur e & marshy land	Paddy Scrubs (godap ara)	-	-	-	-
8	7	8	1	Kaluta ra	Kaalawila (Gammattha Uda)	3	36	15	Private	Marshy land	Scrubs (godap ara)	-	-	-	-
9	8	9	1	Kaluta ra	Kotapitiya	5	36	15	Private	Marshy land, Agricultur e & Plantatio ns	Paddy Coconu t	Cocon ut 08	-	-	-
10	9	10	1	Kaluta ra	Poldoowa	3	36	15	Private	Marshy land & plantation s	Coconu t	Cocon ut 08	-	-	-
11	10	11	1	Kaluta ra & Galle	Poldoowa	3	36	15	Private	Marshy land & plantation s (Bentota river)	Coconu t	Cocon ut 15	-	-	-
12	11	12	1	Galle	Bodhimaluw a Aarachchim ulla	4	36	15	Private	Marshy lands, home gardens & plantation s	Coconu t	Cocon ut 20	-	-	-
13	12	13	1	Galle	Kadiyangala Sinharoopa gama	5	36	15	Private	Plantatio ns & home gardens	Coconu t	Cocon ut 150	-	-	-
14	13	14	1	Galle	Angagoda (Cross Galle Road)	7	36	17	Private	Plantatio ns & home gardens	Coconu t Breadfr uit Bambo o bushes	Cocon ut 30 Breadf ruit 02 Bambo o bush 01	1		

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
Pre-constructio	n					
Temporary use of lands	Impact to the existing environment	Selection of lands adhering to local laws and regulations and in close consultation with LAs Contraction facilities should be placed at least 500 m away from water bodies, natural flow paths, important ecological habitats and residential areas	Water and air quality	Air quality Standards and CEA water quality standards	CEB Contractor	Detailed design
Substation location and design	Noise generation Exposure to noise, Nuisance to neighbouring properties	Substation designed to ensure noise will not be a nuisance.	Expected noise emissions based on substation design, noise levels	Noise control regulations in 1994 Noise levels to be specified in tender documents	CEB	Detailed design
	Disturbance to the adjacent lands and the people due to cut and fill operations	Maintain adequate clearance, construction of retaining structures, minimise cut and fill operations adjoining to the dwellings	Proximity to houses and other structures	Setback distances to nearest houses – as per ROW norm of 10 m	CEB	Detailed design
Location of towers and line alignment and design	Exposure to safety related risks	Setback of dwellings to overhead line route designed in accordance with permitted level of power frequency and the regulation of supervision at sites.	Tower location and line alignment selection with respect to nearest dwellings	Setback distances to nearest houses -	CEB	Part of tower sighting survey and detailed alignment survey and design
	Impact on water bodies/land/ residences	Consideration of site location at where they could be located to avoid water bodies or agricultural land as much as possible. Careful site selection to avoid existing settlements	Site location away from water bodies, line alignment selection (distance to dwelling, water and/or agricultural land)	Consultation with local authorities and land owners, CEA water quality standards	CEB	Part of detailed project sighting and survey and design
Equipment specifications and design parameters	Release of chemicals and harmful gases in receptors (air, water, land)	PCBs not used in substation transformers or other project facilities or equipment. Battery, transformer oils, SF ₆ stored at substation sites with appropriate	Compliance with National Environmental (Amendment) Act, of Sri Lanka	Banned under schedule VIII of NEA Act	CEB	Detailed design

Annexure 5 Environment Management Plan (EMP)

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
Encroachment into precious ecological areas	Loss of precious ecological values/ damage to precious species	care. Avoid encroachment by careful site and alignment selection Minimise the need by using existing towers and RoW wherever possible	Floral and faunal habitats loss	Flora and fauna protection act.	CEB	Detailed design
Involuntary resettlement or land acquisition	Loss of lands and structures	Compensation paid for temporary/ permanent loss of productive land as per Sri Lankan procedures	Public complaints	Rates stipulated in the Resettlement plan/Framework for the project	CEB	Prior to construction phase
Encroachment into farmland	Loss of agricultural productivity	Use existing tower footings/towers wherever possible Avoid sighting new towers on farmland wherever possible Farmers compensated for any temporary/permanent loss of productive land trees that need to be trimmed or removed along RoW.	Tower location and line alignment selection Design of Implementation of Crop and tree compensation (based on affected area)	Agrarian Service Act. Consultation with local authorities and design engineers	CEB	Part of detailed alignment survey and design
			Statutory approvals for tree trimming /removal			
Interference with drainage patterns/Irrigation channels	Temporary flooding hazards/loss of agricultural production	Appropriate sighting of towers to avoid channel interference	Site location and line alignment selection	Irrigation Act 1933. Consultation with local authorities and design engineers	CEB	Detailed alignment survey and design
Explosions/Fire	Hazards to life	Design of substations to include modern fire control systems/firewalls. Provision of firefighting equipment to be located close to transformers, power generation equipment.	Substation design compliance with fire prevention and control codes	Tender document to mention detailed specifications	CEB	Part of detailed substation layout and design /drawings
Construction						
Removal or disturbance to	Public inconvenient	Advance notice to the public about the time and the duration of the	Disruption other commercial and	Technical specification	CEB//Contractor	Throughout the construction

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementati Schedule	ion
other public utilities		utility disruption Use of well trained and experienced machinery operators to reduce accidental damage to the public utilities Restore the utilities immediately to overcome public inconvenient	public activities / Public complaints			period	
Acquisition of paddy fields and other lands	Loss of agricultural productivity	Avoid farming season wherever possible for the project activities.Ensure existing irrigation facilities are maintained in working conditionProtect/preserve topsoiltopsoilProtect/preserve completedRepairRepairreinstate etc after construction completedCompensation for temporary loss in agricultural production	Land area of agriculture loss Usage of existing utilities Status of facilities (earthwork in m ³) Implementation of Crop compensation (amount paid, dates, etc.)	Agrarian Service Act. Regular monitoring compliance with regulations	CEB, Contractor through contract provisions	Throughout construction period	the
Temporary outage of the electricity Equipment layout and installation	Loss of power supply to the local community when distribution lines crossing the new line are switched off Noise and vibrations	Advance notice to the public about the time and the duration of the utility disruption Restore the utilities immediately to overcome public inconvenient. Selection of construction techniques and machinery to minimise ground	Houses and commercial premises of power disruption Construction techniques and	Regular monitoring during the period of strengthening the conductors Minimal ground disturbance	Contractor CEB CEB, Contractor through contract	Throughout construction period Construction period	the
Substation construction	Loss of soil	disturbance. Fill for the substation foundations obtained by creating or improving local drain system.	machinery Borrow area sighting (area of site in m ² and estimated volume in m ³)	Laws and regulations of respective LAs	provisions CEB, Contractor through contract provisions	Construction period	
	Water pollution	Construction activities involving significant ground disturbance (i.e. substation land forming) not	Seasonal start and finish of major earthworks (pH,	Timing of major disturbance activities - prior	CEB, Contractor through contract provisions	Construction period	

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
	·	undertaken during the monsoon season.	BOD/COD, Suspended solids, other)	to start of construction activities		
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise level, [dB(a)])	Daytime construction only	CEB, Contractor through contract provisions	Construction period
	Nuisance to elephants if the line route construction crosses elephant path	Complete restriction of construction work for two months before and after the known period of migration by the elephants	Timing of Construction	No construction for two months	CEB, Contractor	Construction period
Construction schedules	Noise nuisance to neighbouring properties	Construction activities only undertaken during the day and local communities informed of the construction schedule.	Timing of construction (noise emissions, [dB(a)])	Daytime construction only	CEB, Contractor through contract provisions	Construction period
Provision of facilities for construction workers	Contamination of receptors (land, water, air)	Construction workforce facilities to include proper sanitation, water supply and waste disposal facilities.	Amenities for Workforce facilities	Presence of proper sanitation, water supply and waste disposal facilities	CEB, Contractor through contract provisions	Construction period
Surplus earthwork/soil	Runoff to cause water pollution, solid waste disposal	Any excess material will only be used as fill material offsite when the owner's agreement has been obtained and with the disposal site restored in a manner that prevents erosion and does not block any drainage path	Location and amount (m ³)of fill disposal Soil disposal locations and volume (m ³)	Appropriate fill disposal and dispersal locations	CEB, Contractor through contract provisions	Construction period
Air Pollution	Loose dust might blow in the area causing dusty conditions	Damping of dust by sprinkling of water within the work area and stack the loose soil and contain it with covers if required.	Soil stacking locations, access roads, tower locations, gantry site	Air Quality Standards	CEB, Contractor through contract provisions	Construction period
Wood/ vegetation harvesting, cut and fill operations	Loss of vegetation and deforestation	Construction workers prohibited from harvesting wood in the project area during their employment.	Illegal wood /vegetation harvesting (area in m ² , number of incidents reported)	Complaints by local people or other evidence of illegal harvesting	CEB, Contractor through contract provisions	Construction period
	Effect on fauna	Prevent his work force from	Habitat loss	Fauna and flora	CEB/ DWC/ DoF	Construction

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
		disturbing to the flora, fauna including hunting of animal and fishing in water bodies		protection Act.		period
		Proper awareness programme regarding conservation of flora, fauna including ground vegetation to all drivers, operators and other workers				
Site clearance	Vegetation	Marking of vegetation to be removed prior to clearance, and strict control on clearing activities to ensure minimal clearance.	Vegetation marking and clearance control (area in m ²)	Felling of trees (Amendment Act. N ^o 01 of 2000 and act of felling of trees control) Clearance strictly limited to target vegetation	CEB, Contractor through contract provisions	Construction period
	Soil erosion and surface runoff	Construction in erosion and flood- prone areas should be restricted to the dry season Treat clearing and filling areas against flow acceleration and construction work should be carefully designed to minimise obstruction or destruction to natural drainage	Soil erosion	Visual inspection (Turbidity and sedimentation)	CEB, Contractor through contract provisions	Construction period
Mechanised construction	Noise, vibration and operator safety, efficient operation Noise, vibration, equipment wear and tear	Construction equipment to be well maintained. Proper maintenance and turning off equipment not in use.	Construction equipment - estimated noise level and operating schedules	Technical specifications, safety regulations, Noise control regulations in 1994	CEB, Contractor through contract provisions	Construction period
Construction of roads for accessibility	Increase in airborne dust particles Increased land	Existing roads and tracks used for construction and maintenance access to the site wherever possible.	Access roads, routes (length and width of new access roads to be	Use of established roads wherever possible	CEB, Contractor through contract provisions	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
	requirement for temporary accessibility	New access ways restricted to a single carriageway width within the RoW.	constructed)	Access restricted to single carriageway width within RoW		
Transportation and storage of materials	Nuisance to the general public	Transport loading and unloading of construction materials should not cause nuisance to the people by way of noise, vibration and dust Avoid storage of construction materials beside the road, around water bodies, residential or public sensitive locations Construction materials should be stored in covered areas to ensure protection from dust, emissions and such materials should be bundled in environment friendly and nuisance free manner	Water and air quality	National Environment Act Laws and regulations of respective LAs National Emission Standards and CEA water quality standards	CEB/ CEA/LAs	Construction period
Trimming/cutting of trees within RoW	Fire hazards Loss of vegetation and deforestation	Trees allowed to grow up to a height within the RoW by maintaining adequate clearance between the top of tree and the conductor as per the regulations. Trees that can survive pruning to comply should be pruned instead of cleared. Felled trees and other cleared or pruned vegetation to be disposed of as authorised by the statutory bodies.	Species-specific tree retention as approved by statutory authorities (average and maximum tree height at maturity, in metres) Disposal of cleared vegetation as approved by the statutory authorities (area cleared in m ²)	Felling of trees (Amendment Act. No 01, of 2000 and act of felling of trees control) Presence of target species in RoW following vegetation clearance.	CEB, Contractor through contract provisions	Construction period
Health and safety	Injury and sickness of workers and	Contract provisions specifying minimum setback requirements for	Contract clauses (number of	National Health and safety	CEB (Contractor through contract	Construction period

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule
	members of the public	construction camps from water bodies, reserved areas etc. Contractor to prepare and implement a health and safety plan. Contractor to arrange for health and	incidents and total lost-work days caused by injuries and sickness)	regulations World Bank EHS Guidelines for Electric Power Transmission and Distribution	provisions)	
Nuisance to nearby properties	Losses to neighbouring land uses/ values	Contract clauses specifying careful construction practices. Use existing access ways as much as possible. Productive land will be reinstated following completion of construction Compensation will be paid for loss of production, if any.	Contract clauses Design basis and layout Reinstatement of land status (area affected, m ²) Implementation of Tree/Crop compensation (amount paid)	Incorporating good construction management, design engineering practices Consultation with affected parties immediately after completion of construction and after the first harvest	CEB (Contractor through contract provisions)	Construction period
Operation and M	laintenance Phase					
Electric shock	Death or injury to the workers and public	Security fences around substation Establishment of warning signs Careful design using appropriate technologies to minimise hazards	Proper maintenance of fences and sign boards Usage of appropriate technologies (lost work days due to illness and injuries)	Periodic maintenance Number of programmes and percent of staff /workers covered	CEB	Throughout the operation
Noise generation	Nuisance to the community around the site	Provision of noise barriers	Noise level	Noise level (db)- Once a year	СЕВ	Throughout the operation
Maintenance of Distribution line	Exposure to electromagnetic	Distribution line design to comply with the limits of electromagnetic	Required ground clearance (metres)	Ground clearance -	CEB	Throughout the operation

Project Activity	Potential Environmental Impact	Mitigation Action	Monitoring Scope	Standards	Institutional Responsibility	Implementation Schedule		
	interference	interference from overhead power lines						
Substation maintenance	Exposure to electromagnetic interference	Substation design to comply with the limits of electromagnetic interference within floor area	Required vibrations level, instrumentation	Technical specifications	CEB	Throughout operation	the	
Oil spillage	Contamination of land/nearby water bodies	Substation transformers located within secure and impervious bundled areas with a storage capacity of at least 110% of the capacity of oil in transformers and associated reserve tanks.	Substation bounding ("as-built" diagrams)	National Environment Act, Bounding capacity and permeability	CEB	Throughout operation	the	
SF6 management	Emission of most potent GHG causing climate Change	Reduction of SF6 emission through awareness, replacement of old seals. Proper handling and storage by controlled inventory and use enhance recovery and applying new technologies to reduce leakage.	(i) regular monitoring of SF6 through pressure gauges; (ii) use of handheld leak detectors to monitor leaks; (iii) prepare annual inventory checklist of SF6 consumption, purchase, and losses to track emissions, and (iv) provide training to staff on proper handling of SF6.	Continuous monitoring	CEB	Throughout operation	the	
Environmen	Project stage	Parameters	Location	Frequenc	Standards	Rate	Implementation	Supervisio
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tal		to be		У		(LKR)		n
component		monitored						
1. Air Quality	A. Pre- construction stage (The project after assign to contractor)	SO ₂ , NO ₂ , CO, Pb, PM10, TSPM	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	A single time	NAAQS of Sri Lanka	Per sample LKR 9,000	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/C EB/CEA
	B. Construction Stage	SO ₂ , NO ₂ , CO, Pb, PM10, TSPM	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	Two times	NAAQS of Sri Lanka	Per sample LKR 9,000	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/C EB/CEA
	C. Operation Stage	SO ₂ , NO ₂ , CO, Pb, PM10, TSPM	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	A single time	NAAQS of Sri Lanka	Per sample LKR 9,000	CEB by engaging approved monitoring agency(Sri Lankan Government)	CEB/CEA
2. Water Quality	A. Pre- construction stage (The project after assign to contractor)	EC, TSS, DO, BOD, P ^H Oil and grease, Pb, E	Nearest wells (2 wells) around gantry, waterbodies, lagoons (more than one sample)	A single time	CEA Water Quality Regulations	Per sample LKR 14,000	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/C EB/CEA
	B. Construction Stage	EC, TSS, DO, BOD, P ^H Oil and grease, Pb, E	Nearest wells (2 wells) around gantry, waterbodies, lagoons (more than one sample)	1 time/ 3 months	CEA Water Quality Regulations	Per sample LKR 14,000	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/C EB/CEA
	C. Operation Stage	EC, TSS, DO, BOD, P ^H Oil and grease, Pb, E	Nearest wells (2 wells) around gantry, waterbodies, lagoons (more	1 time/ 3 months	CEA Water Quality Regulations	Per sample LKR 14,000	CEB by engaging approved monitoring agency(Sri Lankan Government)	CEB/CEA

Annexure 6 Environmental Parameters and Periodicity for	or Environmental Monitoring Plan
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Environmen	Project stage	Parameters	Location	Frequenc	Standards	Rate	Implementation	Supervisio
tal		to be		у		(LKR)	-	n
component		monitored						
			than one sample)					
3. Noise/ Vibration	A. Pre- construction stage (The project after assign to contractor)	Noise level (dB level)	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	A single time	National Environment al (Noise Control) Regulations, NAAQS	Per sample LKR 6,500	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/C EB/CEA
	B. Construction Stage	Noise level (dB level)	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	2 times year	National Environment al (Noise Control) Regulations, NAAQS	Per sample LKR 6,500	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/C EB/CEA
	C. Operation Stage	Noise level (dB level)	Inside and outside (0.5 km) of the proposed gantry, near major building (more than one sample)	3 times year	National Environment al (Noise Control) Regulations, NAAQS	Per sample LKR 6,500	CEB by engaging approved monitoring agency(Sri Lankan Government)	CEB/CEA
4. Soil	A. Pre- construction stage (The project after assign to contractor)	P^H Sulphate (SO ₃), Chloride, ORP, Salinity, Resistively, Organic Matter, Moisture Content	Inside and outside (just close to the proposed site, 2 locations) of the proposed substation	A single time	Technical specification s	Per sample LKR 13,500	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/C EB/CEA
	B. Construction Stage	P^H Sulphate (SO ₃), Chloride, ORP, Salinity, Resistively, Organic Matter, Moisture Content	Inside and outside (just close to the proposed site, 2 locations) of the proposed substation	Two times	Technical specification s	Per sample LKR 13,500	Contractor by engaging approved monitoring agency(Sri Lankan Government)	Contractor/C EB/CEA
	C. Operation Stage	P [⊓] Sulphate (SO ₃), Chloride, ORP, Salinity, Resistively,	Inside and outside (just close to the proposed site, 2	A single time	Technical specification s	Per sample LKR 13,500	CEB by engaging approved monitoring agency(Sri Lankan Government)	CEB/CEA

Environmen	Project stage	Parameters	s Location	Frequenc	Standards	Rate	Implementation	Supervisio
tal		to	be	у		(LKR)		n
component		monitored						
		Organic Ma Moisture Content	tter, locations) of the proposed substation					
5. SF6	Operation Stage	Volumetric from equipment	loss GIS equipment, GIS circuit breakers	Online monitoring by data loggers	As per Approved Specification s of Equipment	Nil	Instrumentation of the supplier	O&M staff
Abbreviations	:							

SO ₂ - Sulphur Dioxide	NO ₂₋ - Nitrogen Dioxide	CO- Carbon Monoxide
Pb- Lead	PM10- Particulate Matter <10	TSPM- Total suspended Particulate Matter
EC- Electrical Conductivity	DO- Dissolved Oxygen	TSS- Total Suspended Solis
BOD- Biological Oxygen Demand	NAAQS- National Air Quality Standards	CEA- Central Environmental Authority
NWQS- National Water Quality Standards	CEB- Ceylon Electricity Board	

Notes: Transport and Accommodation cost, NBT, VAT etc. are not included for the EMoP. Rates valid for the period of 60 days. Information based on the quotation provided by NBRO (National Building Research Organisation).

Annexure 7 Environmental Safeguard Monitoring Report

Environmental Safeguard Monitoring Report

Reporting Period {From Month, Year to Month, Year} Date {Month, Year}

SRI: Green Power Development and Energy Efficiency Improvement Investment Program-Tranche 2

Prepared by the Ceylon Electricity Board for the Asian Development Bank

This environmental safeguard monitoring report is a document of the borrower and made publicly available in accordance with ADB's Public Communications Policy 2011 and the Safeguard Policy Statement 2009. The views expressed herein do not necessarily represent those of ADB's Board of Directors, Management, or staff

Illustrative Contents

Page

Executive Summary

• Brief status of environmental compliance during the coverage period

1.0 Introduction

- 1.1 Brief Project Description
- 1.2 Project Progress Status and Implementation Schedule

2.0 Compliance to National Regulations

2.1 Environmental Conservation Rules 1997

3.0 Compliance to Environmental Covenants from the ADB Loan Agreement

3.1 Schedule 5 Environment (prepare a matrix to show how compliance was achieved)

4.0 Compliance to Environmental Management Plan

(Refer to the EMP of the Project)

5.0 Safeguards Monitoring Results and Unanticipated Impacts

(Refer to the Environmental Monitoring Plan and document any exceedance to environmental standards (if any), or any unanticipated impact not included in the EMP and any correction action/measures taken)

6.0 Implementation of Grievance Redress Mechanism and Complaints Received from Stakeholders

(Summary of any complaint/grievance and the status of action taken)

7.0 Conclusion and Recommendations

Annexure 8 Granting of Necessary Way leaves for Electricity Networks in Sri Lanka -Guidelines for Licensees, Divisional Secretaries and Landowners and/or Occupiers (A DOCUMENT OF THE PUBLIC UTILITIES COMMISSION OF SRI LANKA dated 27th August 2009)

INTRODUCTION

• The enactment of the Sri Lanka Electricity Act N^o 20 of 2009 (SLEA) has vested powers with the Public Utilities Commission of Sri Lanka (the Commission) to regulate the electricity industry of Sri Lanka.

• Acting on the powers derived, PUCSL has granted licenses to the Ceylon Electricity Board (CEB) and Lanka Electricity Company (Pvt) Ltd (LECO). Accordingly, it has become their statutory duty to develop, maintain and operate efficient and economical systems for transmission and distribution of electricity.

• Transmission networks are owned and operated by the CEB, whereas the distribution systems are owned and operated by CEB and LECO.

• With more than 80% of the population having access to electricity in Sri Lanka, electricity transmission and distribution systems have been made available in almost all areas where there is human habitat. In the process, electric lines and associated equipment are (such as poles, conductors, reclosers, sectionalisers, various types of switches, metering equipment, staywires, transformers, etc.) installed over or under private lands.

• GoSL target is to provide electricity to all by 2015 and with the economic development taking place, demand for electricity is growing at a steady pace. This will necessitate the licensees to use more and more private lands in future as well, to install their networks.

• The licensees need to have access to these lands for the purposes of erecting, inspecting, maintaining, repairing, adjusting, altering, replacing or removing the lines or other equipment.

• In these Guidelines, 'wayleave' in relation to a land means such interest in the land as consists of a right of a licensee, to install and keep installed, an electric line: on, under, or over that land; and to have access to that land for the purposes of inspecting, maintaining, adjusting, repairing, altering, removing or replacing such electric line.

• This document is intended to provide general guidance to:

a) electricity licensees (CEB/LECO) who will be the applicants for the grant of wayleave;

b) the land owners/occupiers whose land is or may be the subject of such application; and

c) Divisional Secretaries (who are empowered to act as representatives of the Commission)

• In terms of Section 3(5) of Schedule I of SLEA, the Commission is empowered to appoint a person to act on behalf of the Commission to carry out specified functions relating to the grant of wayleave clearances.

• Accordingly, in terms of the Gazette Extraordinary Nº 1604/6 dated 1st June 2009, the Divisional Secretaries are appointed as representatives of the Commission, hereinafter referred to as "the Person Appointed by the Commission". Pursuant to the appointment as representatives of the Commission, the Divisional Secretaries are mandated to:

a) Look in to issues/objections of the relevant clearing of way-leaves and installation of electrical lines on lands owned by private parties by giving such parties fair hearing on behalf of the Commission and make recommendations to the Commission; and

b) Receive and acknowledge such issues/objections on the above from the relevant parties in writing on behalf of the Commission and to take appropriate actions as per above.

PROCEDURES TO BE FOLLOWED UNDER SLEA

• The Sections 3 to 7 of Schedule I of the SLEA govern the wayleave clearances whereas the Sections 7 to 10 of Schedule II govern the entry into premises.

• There are two possible scenarios relevant to the grant of a wayleave: for the installation of a new electric line/apparatus; or when there is a request by a landowner/occupier to remove an existing line/apparatus. The Person Appointed by the Commission would also have to consider the matters referred to it in relation to the removal of trees which are/may obstruct, interfere or cause a danger to an electric line or plant.

1. Entry into Any Land or Premises

• Where a licensee wishes to enter a land or premises for the purpose of installing an electric

line/plant, minimum of three (3) days notice (specimen notice: appendix 1) stating the nature and extent of the work intended to be carried out, has to be given to the occupier if the land is occupied and to the owner if it is not occupied.

• In cases where the land is not occupied and the name and the address of the owner cannot be ascertained, the notice referred to above should be exhibited at a conspicuous position of the land.

• If the land/premises is used/reserved for a public purpose, then the notice has to be given to the officer or any other person in charge of that land/premises.

• Licensee shall issue written authorisation to the person who is exercising the powers to enter the land/premises.

• If by way of entering the land/premises, if any damage is caused to the land or to any movable or immovable property or caused any disturbance to any person, then he/she may claim compensation from the licensees. The Commission will determine the extent of compensation to be paid.

• Where the efforts made by a licensee to enter any premises under the powers conferred to it by the SLEA were unsuccessful, the permission should be sought by applying to the Magistrate's Courts having jurisdiction over the place and its decision shall be final.

2. Obtaining a Wayleave for a New Electricity Line/Plant

• All efforts should be made by the licensee who requires the wayleave, to enter into an agreement with the landowner/occupier to obtain such wayleave. The terms and conditions of the agreement shall include, among others, the period for which the wayleave is granted

• (if it is not permanent) and the compensation to be paid by the licensee for the disturbances

• and/or damages caused by the installation of the new line/plant.

• Where the licensee is unable to reach an agreement with the landowner/occupier in relation to obtaining the wayleave, it shall give the landowner/occupier a minimum of twenty one (21) days notice (specimen notice: appendix 4) requiring the grant of wayleave.

• If the landowner/occupier fails to grant the wayleave within the period specified in the notice or grants the wayleave subject to the terms and conditions which are not acceptable to the licensee, within seven (7) days from the expiry of the period specified in the notice, the licensee may make an application to the Person Appointed by the Commission requiring the grant of the wayleave. (particulars to be submitted along with an application to grant of wayleave.

• In the application, it is necessary for the licensee to prove that the acquisition of the wayleave is necessary to carry out its licensed activities and most importantly that it has taken all possible measures to reach an agreement, but have been unsuccessful.

• The application shall not be considered, if the proposed line is to be installed over a land which is covered by an authorised dwelling or permission has been granted to construct a dwelling.

• On the receipt of a successful application, the Person Appointed by the Commission will hold an inquiry, to provide an opportunity for the occupier or the land owner (where the occupier is not the owner) to be heard, and forward his/her recommendations to the Commission relating to the application within fourteen (14) days of the receipt of such application.

• Within six (6) weeks of the application, considering the recommendation of the Person Appointed by the Commission:

a) the Commission may either authorise or prohibit the licensee any of the acts mentioned in the notice (issued to the land owner or occupier) either unconditionally or subject to such terms, conditions and stipulations as it thinks fit; or

b) if the Commission is satisfied that the acquisition of that wayleave is necessary for carrying on of the activities authorised by the license of the licensee, recommend to the Minister to acquire the wayleave under the Land Acquisition Act.

• If the Commission's recommendation to acquire the wayleave is approved, the Minister may by an Order published in the Gazette acquire the wayleave under the Land Acquisition Act and transfer to the licensee. Wayleave acquired through the Land Acquisition Act shall not be subject to any provision of any enactment and shall bind any person who has been the owner/occupier of the land over which wayleave has been granted.

• In addition, the Person Appointed by the Commission will also recommend to the Commission the amounts of compensation payable to the owner or occupier of the land. Licensee is bound to pay compensation, as determined by the Commission, to the owner or occupier of the land. If the owner is

unknown or the ownership is subject to dispute, licensee will deposit the sum to be paid as compensation in the district courts and inform the relevant parties accordingly or exhibit that notice at a conspicuous position of the land.

• Any person who is aggrieved by the Commission's determination on the subject of compensation could institute action in a Court of proper jurisdiction against the licensee.

3. When a Request is made by the Owner/Occupier of a Land to Remove an Existing Electricity Line or Plant

• Where an existing wayleave:

a) is determined by the expiration of the period specified in the agreement;

b) is terminated according to a term contained in the wayleave agreement; or

c) ceases to be binding following a change in ownership or occupancy,

d) the landowner/occupier may request for the removal of the electricity line/apparatus by giving three (3) months' notice.

• On receipt of such notice, the licensee is required to comply with the notice and remove the electricity line/apparatus before the end of the specified period. However if it does not want to comply with the request, all efforts should be made by the licensee to enter into a fresh agreement with the landowner/occupier in order to secure such wayleave.

• Where the licensee is unable to reach an agreement with the landowner/occupier in relation to securing the wayleave, an application would have to be forwarded to the Person Appointed by the Commission to secure the wayleave (as explained in previous section), within three (3) months of the notice. (particulars to be submitted along with an application to secure the wayleave

• In the application, it is necessary for the licensee to prove that the wayleave is necessary to carry out its licensed activities and most importantly that it has taken all possible measures to reach an agreement, but have been unsuccessful.

• On the receipt of a successful application, the Person Appointed by the Commission will hold an inquiry, to provide an opportunity for the occupier or the land owner (where the occupier is not the owner) to be heard, and forward his/her recommendations to the Commission relating to the application within fourteen (14) days of the receipt of such application.

• Within six (6) weeks of the application, considering the recommendation of the Person Appointed by the Commission:

a) the Commission may either authorise or prohibit the licensee to keep installed the electricity line/apparatus specified in the notice issued by the land owner/occupier either unconditionally or subject to such terms, conditions and stipulations as it thinks fit; or

b) if the Commission is satisfied that the acquisition of that wayleave is necessary for carrying on of the activities authorised by the license of the licensee, recommend to the Minister to acquire the wayleave under the Land Acquisition Act.

• If the licensee is prohibited to keep installed the electricity line/apparatus specified in the notice, the licensee will be required to remove the electricity line/apparatus within one (1) month from the date of the Commission's decision or such longer period as the Commission may specify.

4. Removal of Trees which are/may Obstruct, Interfere an Electric Line/Plant or Constitute an Unacceptable Danger to Public (flow diagram showing the procedure: Appendix 8)

• When a tree is in close proximity to an electricity line/plant installed or to be installed and if the licensee is of the opinion that it will obstruct or interfere with the installation, maintenance or working of an electric line/plant or is a source of danger to public, a notice is required to be issued to the occupier of the land with a copy to the owner (where the occupier is not the owner) of the land requiring him/her to fell or lop the tree or cut back its roots, within a period of three (3) days.

• If the occupier complies with the notice, licensee shall pay the reasonable expenses incurred by him/her in complying with the requirements of the notice.

• If within three (3) days of the notice the requirements of the notice are not complied with and neither the owner nor occupier of the land gives a counter-notice, the licensee may cause the tree to be felled or lopped or its roots to be cut back so as to prevent it from obstructing or interfering with the installation, maintenance or working of an electric line/plant or being a source of danger to public. In doing so, the licensee shall:

a) Do it in accordance with good arboricultural practices and so as to do as little damages as possible to trees, fences, hedges and growing crops;

b) Cause the felled trees, lopped boughs or root cuttings to be removed in accordance with the direction of the owner or occupier; and

c) make good any damage caused to the land

• However, if a counter-notice is received objecting to the requirements of the notice within the three (3) days, the matter shall be referred to the Person Appointed by the Commission to hold an inquiry, where all parties will be heard. (particulars to be submitted along with such referral: appendix 9)

• On the receipt of such referral, the Person Appointed by the Commission will hold an inquiry, and forward his/her recommendations to the Commission within fourteen (14) days of the receipt of such referral.

• Upon receipt of the recommendation of the Person Appointed by the Commission, the Commission may make an order:

a) allowing the licensee to cause the tree to be felled or lopped or its roots to be cut back, after notifying any person by whom a counter notice was given; and

b) determining any question as to what expenses (if any) are to be paid to the licensee by the owner or occupier of the land.

Annexure 9 Site Visit Photographs for Distribution lines

D-1. - Old Anuradhapura GSS to Mahailuppallama Gantry D-2. - Gantry at Mahailuppallama





D-3. - Ethgala Gantry to Storefield Gantry D-4. - Gantry at Ethgala



AP 3, in a tea small holding

AP4 in an abandoned land with Guinea grass





D-5. - Kappalthurai GSS to Chinabay Gantry.

D-6. - Gantry at Chinabay







D-7. - Augmentation of Ethulkotte PSS



Plate 3 PSS land- Ethulkotte	Plate 4 PSS- Ethlkotte
Plate 5 Main building (CEB DD 3)and the PSS	

D-8. - Embilipitiya GSS to Weniwelara D-9. - Gantry at Weniwelara









D-10. - New PSS at Rattanapitiya





D-11. - Augmentation of Beligaha PSS



Plate1 Water logging inside PSS

Plate 2 Transnformer and yard at PSS

D-12. - Matugama GSS to Bentota PSS





